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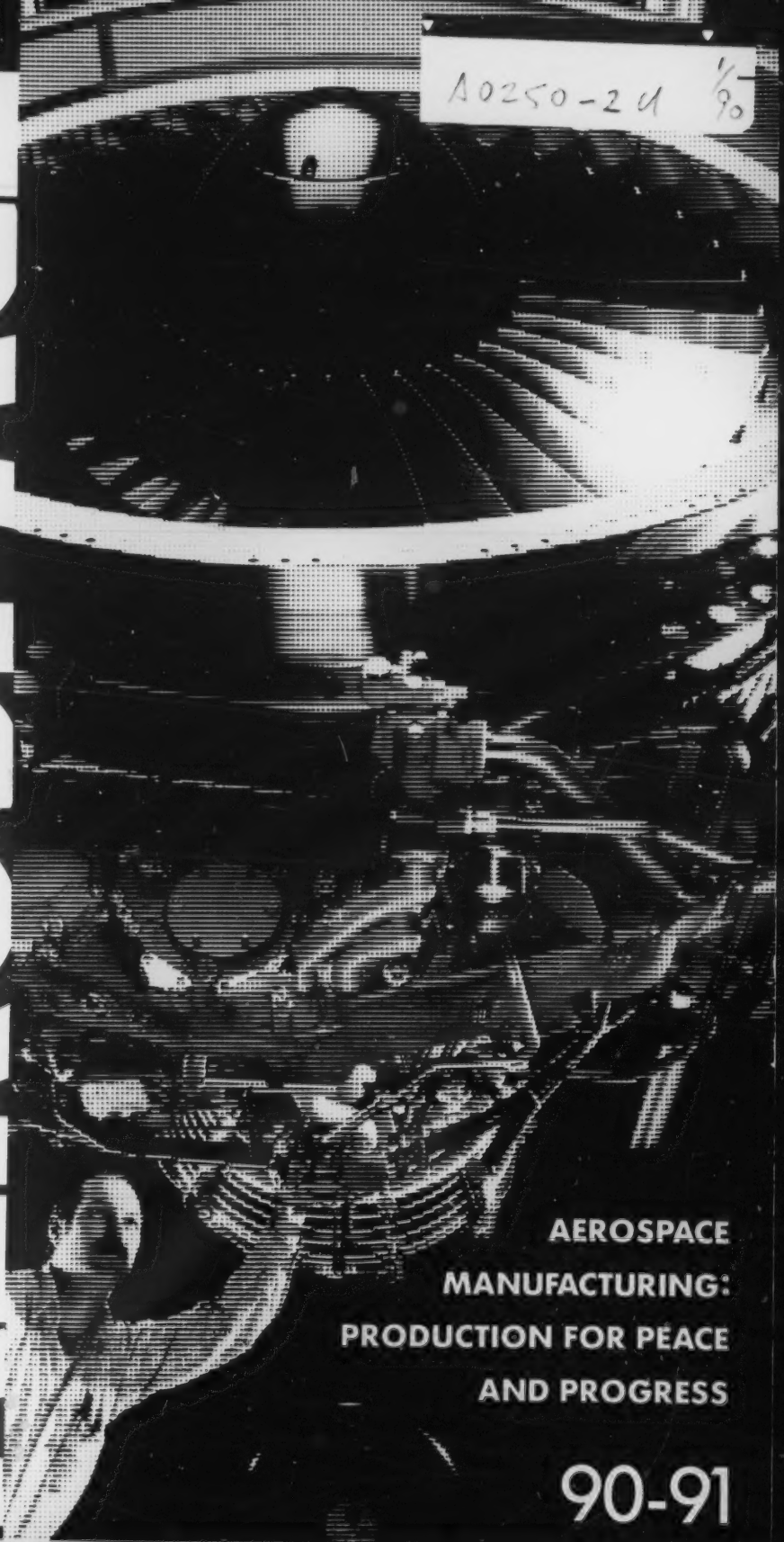
AEROSPACE



AEROSPACE MANUFACTURING: PRODUCTION FOR PEACE AND PROGRESS

90-91

FACTS & FIGURES

AEROSPACE FACTS & FIGURES 90-91

$20.00

Compiled by Economic Data Service
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Aerospace Industries Association of America, Inc.

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Design: Alpert & Alpert, Inc.

Published by Aerospace Industries Association of America, Inc.
1250 Eye Street, N.W.
Washington, D. C. 20005
(202) 371-8400
FAX (202) 371-8470

For information and orders, call: (202) 371-8561

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Library of Congress Catalog No. 46-25007
International Standard Book No. 0898-4425

Acknowledgments

Air Transport Association of America
Battelle Memorial Institute
Council of Economic Advisers
Export-Import Bank of the United States
Exxon International Company
General Aviation Manufacturers Association
Helicopter Association International
International Air Transport Association
International Civil Aviation Organization
McGraw-Hill Publications Company
National Aeronautics and Space Administration
National Science Foundation
Office of Management and Budget
TRW Space & Technology Group
U.S. Departments of
  Commerce (Bureau of the Census, Bureau of Economic Analysis, International Trade Administration)
  Defense (Comptroller; Directorate for Information, Operations and Reports; Army; Navy; Air Force; Strategic Defense Initiative Organization)
  Labor (Bureau of Labor Statistics)
  Transportation (Federal Aviation Administration, Office of Aviation Information Management)

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AEROSPACE MANUFACTURING:

PRODUCTION FOR PEACE AND PROGRESS

The U.S. aerospace industry produces things that fly—aircraft, launch vehicles, satellites, missiles. No matter how high, how far, or how fast they soar, these products that defend, transport, and serve us in a multitude of ways all begin with some very ''feet on the ground'' fundamentals. They are produced from things as basic as nuts, bolts, and sheet metal and as advanced as fiber-matrix composites and tiny chips with incredible computing power.

The manufacturing processes that make today's aircraft, missiles and space vehicles possible range from the traditional skills of milling, planing and welding (now often computer-aided) to advanced capabilities such as superplastic forming of composite parts and robotic assembly. The performance and endurance of aerospace products begin with design specifications, but become reality on the factory floor. Aerospace design and manufacturing personnel work closely together to see that quality is built in—from the beginning.

FOREWORD

90-91

For the U.S. aerospace industry, 1989 was a year of contradiction.

It was a year in which the industry set records for sales, new orders, backlog, export volume and trade balance. On the down side, however, it was a year in which earnings dropped sharply despite peak-level sales, and a year in which the long-anticipated decline in defense sales became statistical fact.

The impact on sales of five consecutive negative growth defense budgets—six, counting the Fiscal Year 1991 budget being finalized at publication time—had been delayed because of the long lead times involved in production of major aerospace systems. But 1989 data confirmed the start of the military sales decline: industry sales of aerospace products and services to the Department of Defense dropped by approximately $3 billion below the previous year's level.

Although the backlog of military orders remains high, the defense budget trend of FY 1985-91 leaves no doubt that the industry's defense sales will decline substantially in the decade of the 1990s.

On the positive side of the ledger, sales in the civil aircraft sector registered a strong increase for the second straight year—up 16 percent in 1989 after a 23 percent jump in 1988. These gains are due primarily to the industry's exceptional performance in sales of commercial transport aircraft. A record backlog of transport orders and a flow of new orders that continues strong suggests a sales level for this sector in the 1990s that might be double the level of the 1980s.

Sales of space systems, civil and military combined, also reached a new record level in 1989. If adequately funded, the Administration's space plans for the 1990s, coupled with prospects for expansion of commercial space business, promise significantly greater industry space activity.

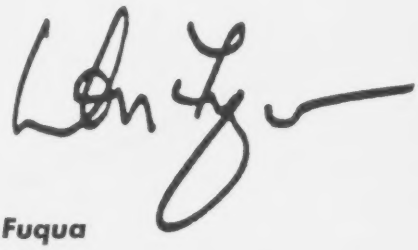
It has become almost routine to report that the industry set new records for export sales and trade balance; such, indeed, was the case again in 1989. Large scale aerospace sales offset to a considerable degree the 14th consecutive trade deficit recorded by the nation as a whole, underlining once again the value to the U.S. economy of high value, high technology aerospace exports. It must be noted, however, that aerospace imports increased by some 10 percent, a reminder of the still-intensifying competition our industry faces from abroad.

For the aerospace industry, the decade of the 1990s will be a period of transition characterized by declining defense activity, a shift in product mix and extensive changes in management, R&D, manufacturing and other ways of doing business, changes designed to improve efficiency in every aspect of industry operations and maximize earnings at predictably lower sales levels.

As regards future sales volume, the industry is not going out of the defense business; the government's plans for a downsized, restructured defense force suggest a continuing important role for the defense industry and a moderately healthy level of production and R&D activity despite lower defense budgets.

We believe that the reduced defense business volume will be offset to a substantial degree—but not entirely—by increased commercial aircraft and space sales and possibly further offset by expanded international ollaborations involving both civil and military products.

The overall industry outlook, therefore, is for a decline in real, inflation-adjusted business volume of moderate—but far from catastrophic—proportions. We are sliding into another valley in the peak-and-valley profile that has characterized the history of the U.S. aerospace industry—and as we have done so often before we will emerge from the valley and begin a new ascent.



Don Fuqua
President
Aerospace Industries Association

AEROSPACE SUMMARY

90-91

For the U.S. aerospace industry, 1989 was a peak year in terms of sales, new orders, backlog, export volume and trade balance. Earnings, however, dipped sharply below the previous year's level, reflecting for the most part a continuance of defense procurement policies and practices that generally inhibit contractor profits.

Here is the breakdown of the industry's performance in 1989:

Sales. Total sales amounted to $117.6 billion, according to Aerospace Industries Association (AIA) data. The figure compares with $114.6 billion in 1988.

Sales of aerospace products and services to the Department of Defense (DoD) fell off for the second consecutive year as the industry began to feel the impact of five straight negative growth defense budgets. Sales to DoD amounted to $58.5 billion, down from $61.3 billion in the previous year. Despite the drop, DoD sales accounted for half of total aerospace sales.

In a breakdown by product group, aircraft sector sales predominated, as is customarily the case. Aircraft sales totaled $61 billion, up slightly from $60.9 billion in 1988. Military aircraft sales, however, dropped an even $3 billion while sales of civil aircraft increased by $3.1 billion. Sales figures for military aircraft totaled $38.9 billion in 1989 compared to $22.1 billion for civil aircraft.

Sales of space systems ranked second among product categories for the seventh straight year. Combined civil/military space sales totaled $25.8 billion in 1989, up more than $1.4 billion from the 1988 total. Sales of missiles increased to $11.2 billion last year, compared

with $10.3 billion in the previous year. The "related products and services" grouping showed only a slight increase to $19.6 billion from $19.1 billion in 1988.

For 1989, aerospace sales represented 2.3 percent of the U.S. Gross National Product and 4.2 percent of total sales by all U.S. manufacturing industries. The comparable figures for 1989 were 2.4 percent and 4.4 percent.

Earnings. The industry recorded a net profit after taxes of only $3.9 billion in 1989. This compares with a profit of $4.9 billion for the previous year. The precipitous drop in earnings occurred despite the record high sales level reached by the industry during 1989. The profit margins reflected the adverse impact that stringent procurement policies and practices had on the industry's defense business.

Aerospace profit levels remained far below the average for all U.S. manufacturing companies in 1989. As a percentage of sales, the profit rate for aerospace companies last year was 3.3 percent, compared with the average 5 percent for all manufacturing corporations. The profit rate, as a percentage of assets, was 3.3 percent in 1989 for aerospace companies, compared with 5.6 percent for all manufacturing corporations. As a percentage of equity, the average profit rate amounted to 10.7 percent, while the all-industry average was 13.7 percent.

Orders and Backlogs. Total orders for aerospace companies surged to an all-time record of $176.5 billion in 1989, up from the previous year's record of $147.1 billion.

The flow of new aerospace orders from government agencies in 1989 rebounded for the second straight year after experiencing a slight decline during 1986 and 1987. As reported by the Bureau of the Census, government orders in 1989 totaled $81.7 billion, an increase of over 20 percent from the previous year. The increase undoubtedly reflects some orders deferred from prior year budgets and may tend to delay the

full effects of several negative growth defense budgets. Nonetheless, the overall downward trend in the budget foreshadows a shift in industry product mix with the commercial sector playing a larger role for much of the decade.

Non-U.S. government orders also grew by nearly 20 percent in 1989, totaling $94.7 billion, compared with $79.3 for the previous year. It was the second time since 1980 (and the second year in a row) that non-U.S. government orders topped U.S. government orders. The major component of net new non-U.S. government orders was $73.9 billion for aircraft, engines, and parts, mostly transport aircraft and related systems.

As expected, with such a heavy flow of new orders, the industry's 1989 backlog also reached a new record level. As of December 31, 1989, backlog of unfilled orders approached the quarter trillion mark, totaling $246.8 billion. This was 29 percent higher than the $191.5 billion at the end of 1988. Non-U.S. government orders accounted for $144.4 billion of the backlog total for 1989, while U.S. government orders were at $102.4 billion. As is usual, the principal element of the backlog was orders for aircraft, engines, and parts—$157.2 billion, almost 64 percent of the total.

Civil Aircraft Production. Commercial transport aircraft sales showed a sharp increase for the fifth straight year, which when coupled with civil helicopter and general aviation sales, brought the total civil aircraft sales to $17.1 billion, up from $15.9 billion in 1988.

The new industry record for sales of commercial transport aircraft, $15.1 billion in 1989, represented a more than 10 percent increase over the previous year total of $13.6 billion. In numerical terms, however, the industry delivered slightly fewer transports in 1989 than in the previous year—398 compared to 423. The backlog for commercial transports at the end of 1989 included orders for 1989 aircraft worth $89.1 billion; this compared with 1,373 planes valued at $58.5 billion at the end of 1988.

Sales of general aviation planes were at $1.8 billion in 1989, down slightly from the 1988 total of $1.9 billion. The number of shipments, however, increased from 1,143 in 1988 to 1,535 units in 1989.

The dollar value of civil helicopter sales also declined in 1989 to $251 million compared with $334 million in 1988. The number of helicopters shipped during 1989 increased, however, to 515 units; the comparable figure for 1988 was 383 units.

Military Aircraft Production. The industry produced 1,227 military aircraft in 1989, down slightly from the 1,305 units delivered in 1988. The figures for 1989, however, showed a slight increase in exports of military aircraft from 618 units in 1988 to 647 units last year.

The 647 military aircraft exported represented a dramatic upturn in the number of units sold directly from U.S. manufacturers to foreign governments; 566 aircraft were shipped to foreign governments in 1989, compared with 480 units the previous year. Foreign Military Sales programs accounted for 81 aircraft sold in 1989, down from 138 units in 1988. The flyaway value of the FMS aircraft was $1.5 billion in 1989, compared with $2.2 billion the previous year. The 580 planes produced for U.S. military agencies had a combined flyaway value of $7.9 billion, down substantially from the previous year's $13.8 billion.

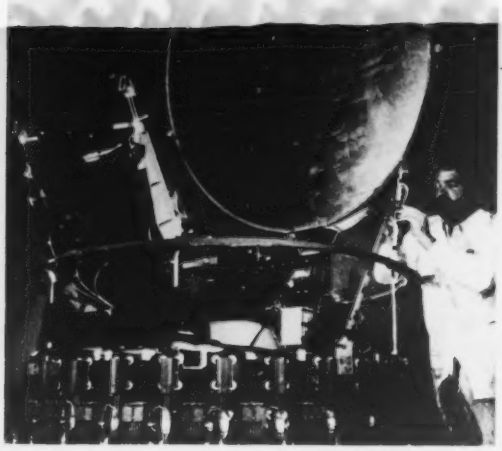
Department of Defense outlays for aircraft procurement declined again in Fiscal Year 1989 to $27.6 billion, down from $28.2 billion in FY 1988. Estimates for the next two fiscal years indicate that the downward trend will continue with outlays of $27.2 billion in FY 1990 and $26.7 billion in FY 1991.

Missile Systems. Sales of missile systems fell further during 1989 according to Bureau of the Census data. The figures, which exclude propulsion units, showed missile sales of $9.3 billion in 1989, compared with $9.5 billion in the previous year.

Census reported that the flow of new orders for missile systems (again excluding propulsion) increased, however, to $10.1 billion, up from $9.4 billion in 1988. Yearend backlog increased also to $15.1 billion in 1989, compared with $14.3 billion in the previous year.

Space Programs. The industry's sales of space systems and related equipment reached another all-time peak in 1979. Total sales of $25.8 billion, up $1.4 billion from the previous record level of $24.3 billion in 1988 continued a 16-year rise in the sales of space systems. The major portion of the total was in military sales, as has been the case since the early 1980s, although specific calendar year figures on the military/civil sales ratio are not available.

Despite continued lower defense budgets, both new orders and backlog for military space rebounded significantly in 1989. According to data from the Bureau of the Census, the $7.7 billion in military orders for spacecraft, space systems and launch vehicle components, exclusive of propulsion units, accounted for more than two-thirds of the $11.5 billion in new orders in 1989. That contrasts with $4.6 billion in new mili-



tary orders the previous year. Non-military orders gained 40 percent from the previous year, $3.8 billion in 1989 compared with $2.7 billion in 1988. The industry's space backlog (once again excluding propulsion) as of December 31, 1989 reflected a similar pattern; total backlog amounted to $12.6 billion compared to $10.8 billion in the previous year. Military backlog rose to $9.1 billion last year compared with $7.9 billion in 1988; non-military figures were $3.5 billion in 1989 compared with $3 billion the previous year.

Research and Development. The Battelle Memorial Institute estimates total U.S. R&D expenditures of $92.6 billion in 1989, while projecting an increase to $100.1 billion in 1990. The projections indicate that federal funding will rise to $33.9 billion in 1990, up from $30.8 billion the previous year; industry funding will rise also to $66.2 billion, compared with $61.9 billion in 1989.

Battelle's projection shows the aerospace industry, perennial leader, as the top R&D performer in 1990 with activities valued at $24.3 billion. The total will include $17.4 billion in federal government funding (up $1.7 billion from 1989) and $6.9 billion in industry funding (nearly twice the $3.5 billion in 1989).

In second place behind aerospace in the 1990 projection was the electrical machinery and communications industry with an estimated outlay of $16.2 billion. Next, in order, were the machinery ($15 billion), transportation equipment ($10.9 billion) and chemicals ($10.8 billion) sectors.

Foreign Trade. For the fifth consecutive year, the U.S. aerospace industry posted a new record for export volume, once again underlining the importance to the U.S. economy of high value, high technology exports as aerospace gains offset to some degree an overall U.S. trade deficit of $109.4 billion. In 1989, aerospace exports amounted to $32.1 billion, up from $26.9 billion in the previous year; they represented slightly over 8.8 percent of the dollar value of all U.S. exports.

Aerospace imports, however, increased to $10 billion in 1989, up by nearly $1 billion from the previous year. Nonetheless, the aerospace trade balance reached a new record—$22.1 billion in 1989, bettering the previous mark of $17.9 billion set in 1988 by more than 23 percent.

Civil products accounted for nearly 80 percent or $25.6 billion of the total U.S. aerospace export volume in 1989. Military products represented $6.5 billion of the $32.1 billion total. The civil product gain of more than $5 billion over the previous year was due largely to a surge of deliveries of commercial transport aircraft, whose dollar volume—$12.3 billion—represented nearly two fifths of all aerospace exports.

Employment. While the U.S. aerospace industry set several sales records in 1989, employment in the industry grew slightly to 1,321,000 compared with 1,317,000 in the previous year. Aerospace employment accounted for 6.7 percent of the total employment in all U.S. manufacturing industries, down from 6.8 percent in 1988.

The aerospace payroll for 1989 amounted to $34.9 billion, up 4.1 percent over the $33.5 billion paid in 1988. The aerospace payroll in 1989, represented 6.4 percent of total payroll outlays by all U.S. manufacturing firms.

STANDARD INDUSTRIAL CLASSIFICATIONS APPLICABLE TO THE AEROSPACE INDUSTRY

3721 **AIRCRAFT**
- 37211 Complete Aircraft, Military Type
- 37212 Complete Aircraft, Personal & Utility Type
- 37213 Complete Aircraft, Commercial Transport Type
- 37214 Modifications, Conversions, Overhaul of Aircraft
- 37216 Other Aeronautical Services on Aircraft

3724 **AIRCRAFT ENGINES AND ENGINE PARTS**
- 37241 Aircraft Engines for U.S. Military Customers
- 37242 Aircraft Engines for Other than U.S. Military
- 37243 Aeronautical Services on Aircraft Engines
- 37244 Aircraft Engine Parts and Accessories

3728 **AIRCRAFT PARTS AND AUXILIARY EQUIPMENT, NEC**
- 37281 Aircraft Parts & Accessories, NEC
- 37283 Research and Development on Aircraft Parts
- 37285 Aircraft Propellers and Parts

3761 **GUIDED MISSILES AND SPACE VEHICLES**
- 37611 Missile Systems, Excluding Propulsion
- 37612 Space Vehicle Systems, Excluding Propulsion
- 37613 Research & Development on Complete Missiles
- 37614 Research & Development on Complete Space Vehicles
- 37615 All Other Services on Complete Missiles & Space Vehicles

3764 **SPACE PROPULSION UNITS AND PARTS**
- 37645 Complete Missile or Space Vehicle Engines and/or Propulsion Units
- 37646 Research and Development on Complete Missile or Space Vehicle Engines and/or Propulsion Units
- 37647 All Other Services on Complete Missile or Space Vehicle Engines and/or Propulsion Units
- 37648 Missile and Space Vehicle Engine and/or Propulsion Unit Parts and Accessories

3769 **SPACE VEHICLE EQUIPMENT, NEC**
- 37692 Missile & Space Vehicle Parts & Subassemblies, NEC
- 37694 Research & Development on Missile & Space Vehicle Parts & Components, NEC

3663 **RADIO AND TELEVISION COMMUNICATION EQUIPMENT**
- 36631 Communication Systems and Equipment, Including Space Satellite Communications Systems
- 36635 Search & Detection Systems and Navigation and Guidance Systems & Equipment
- 36639 Electronic Systems and Equipment NEC, including Electronic Trainers and Simulators

3812 **SEARCH, DETECTION, NAVIGATION, GUIDANCE, AERONAUTICAL AND NAUTICAL SYSTEMS, INSTRUMENTS AND EQUIPMENT**
- 38121 Aeronautical, Nautical, and Navigational Instruments, except Aircraft Engine Instruments

3829 **MEASURING AND CONTROLLING DEVICES, NEC**
- 38291 Aircraft Engine Instruments except Flight

Source: Office of Management and Budget, *Standard Industrial Classification Manual, 1987.*
NOTE: The Standard Industrial Classification (SIC) is a system developed by the U.S. Government to define the industrial composition of the economy, facilitating comparability of statistics. It is revised periodically to reflect the changing industrial composition of the economy.
NEC: Not elsewhere classified.

AEROSPACE INDUSTRY SALES BY CUSTOMER

Calendar Years 1975-1989
(Millions of Dollars)

Year	TOTAL SALES	Aerospace Products and Services				Related Products and Services
		Total	U.S. Government		Other Customers	
			Dept. of Defense	NASA and Other Agencies		
CURRENT DOLLARS						
1975	$ 29,686	$24,894	$13,125	$2,838	$ 8,931	$ 4,792
1976	29,825	24,514	13,403	2,938	8,173	5,311
1977	32,199	26,095	14,368	3,012	8,715	6,104
1978	37,702	30,889	15,533	3,151	12,205	6,813
1979	45,420	37,705	18,918	3,453	15,334	7,715
1980	54,697	45,878	22,795	4,106	18,977	8,819
1981	63,974	53,090	27,244	4,709	21,137	10,884
1982	67,756	56,366	34,016	4,899	17,451	11,390
1983	79,975	66,646	41,558	5,910	19,178	13,329
1984	83,486	69,572	45,969	6,063	17,540	13,914
1985	96,571	80,476	53,178	6,262	21,036	16,095
1986	106,183	88,486	59,161	6,236	23,089	17,697
1987	110,008	91,673	61,817	6,813	23,043	18,335
1988	114,562	95,468	61,327	7,899	26,242	19,094
1989	117,567	97,972	58,457	9,638	29,877	19,594
CONSTANT DOLLARS (1982 = 100)[a]						
1975	$ 56,011	$46,970	$24,764	$5,355	$16,851	$ 9,042[r]
1976	51,422	42,266[r]	23,109	5,066[r]	14,091	9,157
1977	51,850	42,021	23,137	4,850	14,034	9,829
1978	57,648	47,231	23,751	4,818	18,662	10,417
1979	62,822	52,151	26,166	4,776	21,209	10,671
1980	68,116	57,133	28,387	5,113	23,633	10,983
1981	70,768	58,728	30,137	5,209	23,382	12,040
1982	67,756	56,366	34,016	4,899	17,451	11,390
1983	76,239	63,533	39,617	5,634	18,282	12,706
1984	73,491	61,243	40,466	5,337	15,440	12,248
1985[a]	86,611	72,176	47,693	5,616	18,866	14,435
1986[a]	94,806	79,005	52,822	5,568	20,615	15,801
1987[a]	98,662	82,218	55,441	6,110	20,666	16,444
1988[a]	101,025	84,187	54,080	6,966	23,141	16,838
1989[a]	98,382	81,985	48,918	8,065	25,002	16,397

Source: Aerospace Industries Association.

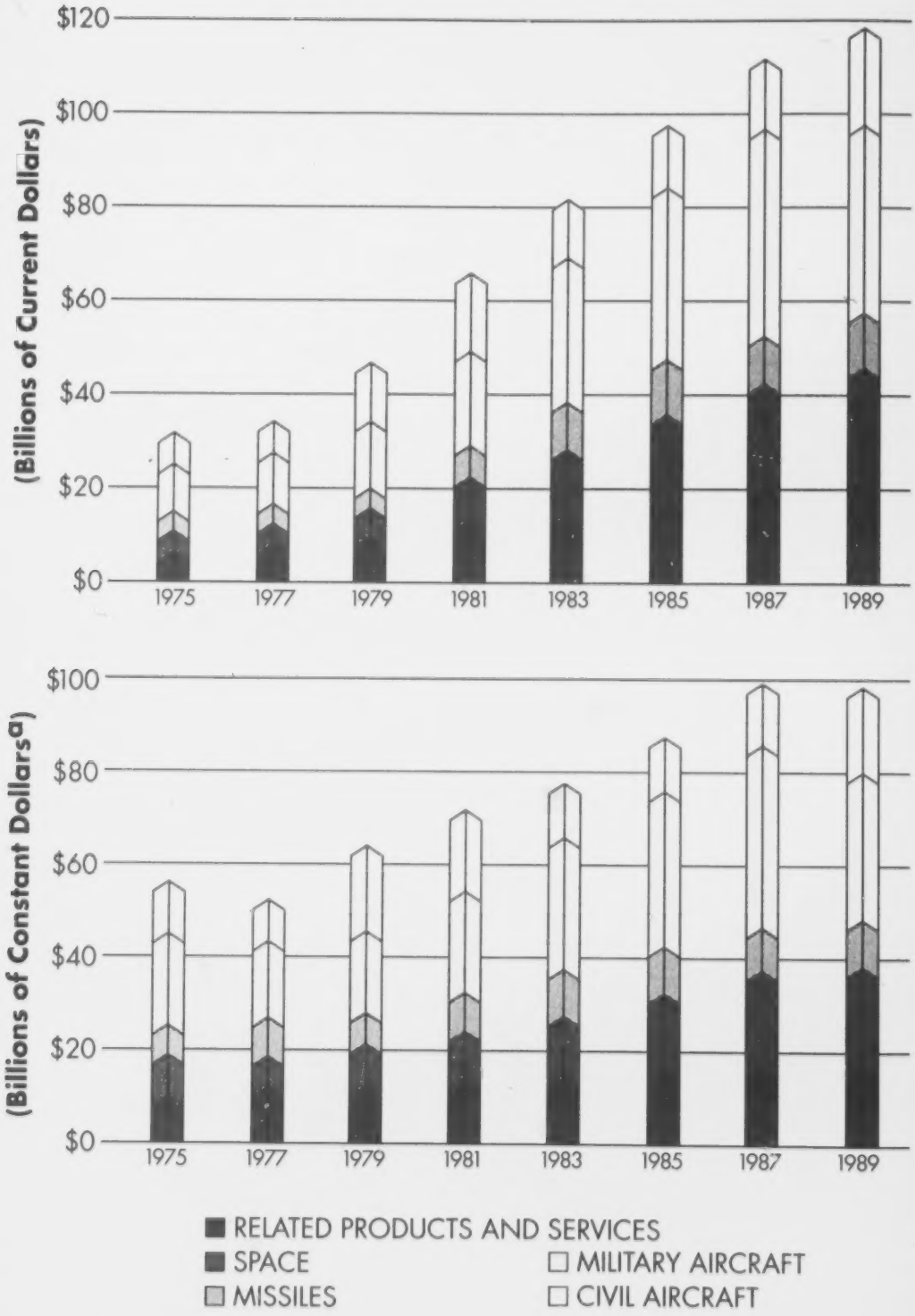
NOTE: See Glossary for explanation of "Aerospace Industry," "Aerospace Sales," "Other Customers," and "Related Products and Services."

A comprehensive revision of the AIA aerospace industry sales series for 1967-1984 was completed in 1985 in order to incorporate different data sources and estimating procedures selected to better reflect the evolving composition of the aerospace industry.

a Based on revised aerospace composite price deflator.

r Revised.

AEROSPACE SALES BY PRODUCT GROUP



Source: Aerospace Industries Association.
[a] Based on revised aerospace composite price deflator (1982=100).

AEROSPACE INDUSTRY SALES BY PRODUCT GROUP

Calendar Years 1975-1989
(Millions of Dollars)

Year	TOTAL SALES	Aircraft			Missiles	Space	Related Products & Services
		Total	Civil	Military			
CURRENT DOLLARS							
1975	$ 29,686	$16,433	$ 6,463	$ 9,970	$ 3,775	$ 4,686	$ 4,792
1976	29,825	16,056	6,007	10,049	3,671	4,787	5,311
1977	32,199	16,988	6,183	10,805	4,106	5,001	6,104
1978	37,702	21,074	8,222	12,852	4,098	5,717	6,813
1979	45,420	26,382	13,227	13,155	4,778	6,545	7,715
1980	54,697	31,464	16,285	15,179	6,469	7,945	8,819
1981	63,974	36,062	16,427	19,635	7,640	9,388	10,884
1982	67,756	35,484	10,982	24,502	10,368	10,514	11,390
1983	79,975	42,431	12,373	30,058	10,269	13,946	13,329
1984	83,486	41,905	10,690	31,215	11,335	16,332	13,914
1985	96,571	50,482	13,730	36,752	11,438	18,556	16,095
1986	106,183	56,405	15,718	40,687	11,964	20,117	17,697
1987	110,008	59,188r	15,465	43,723	10,219	22,266	18,335
1988	114,562	60,886	19,019	41,867	10,270	24,312	19,094
1989	117,567	61,002	22,135	38,867	11,215	25,755	19,594
CONSTANT DOLLARS (1982 = 100)[a]							
1975	$ 56,011	$31,006r	$12,194	$18,811	$ 7,123	$ 8,842	$ 9,042r
1976	51,422	27,683	10,357	17,326	6,329	8,253	9,157
1977	51,850	27,356	9,957	17,399	6,612	8,053	9,829
1978	57,648	32,223	12,572	19,651	6,266	8,742	10,417
1979	62,822	36,490	18,295	18,195	6,609	9,053r	10,671
1980	68,116	39,183	20,280	18,903	8,056	9,894	10,983
1981	70,768	39,892r	18,171	21,720	8,451	10,385	12,040
1982	67,756	35,484	10,982	24,502	10,368	10,514	11,390
1983	76,239	40,449	11,795	28,654	9,789	13,295	12,706
1984	73,491	36,888	9,410	27,478	9,978	14,377	12,248
1985[a]	86,611	45,275	12,314	32,961	10,258	16,642	14,435
1986[a]	94,806	50,362	14,034	36,328	10,682	17,962	15,801
1987[a]	98,662	53,083	13,870	39,213	9,165	19,970	16,444
1988[a]	101,025	53,691	16,772	36,920	9,056	21,439	16,838
1989[a]	98,382	51,048	18,523	32,525	9,385	21,552	16,397

Source: Aerospace Industries Association.
NOTE: See Glossary for explanation of "Aerospace Industry," "Aerospace Sales," "Other Customers," and "Related Products & Services."
A comprehensive revision of the AIA aerospace industry sales series for 1967-1984 was completed in 1985 in order to incorporate different data sources and estimating procedures selected to better reflect the evolving composition of the aerospace industry.
a Based on revised aerospace composite deflator.
r Revised.

SALES OF MAJOR AEROSPACE COMPANIES AS REPORTED BY THE BUREAU OF THE CENSUS

Calendar Years 1975-1989
(Millions of Dollars)

Year	GRAND TOTAL	TOTAL		Aircraft, Engines, & Parts		Missiles, Space, & Rocket Propulsion	Other Aerospace		Non-Aerospace
		U.S. Gov't.	Other	U.S. Gov't.	Other		U.S. Gov't.	Other	
CURRENT DOLLARS									
1975	$ 29,473	$17,314	$12,159	$ 6,859	$ 7,797	$ 6,310	$ 2,070	$1,645	$ 4,792
1976	31,328	19,083	12,245	8,314	7,622	5,880	2,368	1,833	5,311
1977	33,315	20,704	12,611	8,848	7,530	5,775	2,839	2,219	6,104
1978	37,968	21,888	16,080	8,724	10,581	6,380[a]	3,363	2,107[a]	6,813
1979	46,173	23,299[r]	22,944	8,649	16,023	7,197	3,930	2,659	7,715
1980	58,440	26,674	31,766	9,427	20,097	8,393	6,869	2,609	11,045
1981	69,944	33,039	36,905	12,047	21,527	9,722	8,155	3,384	15,109
1982	75,487	42,239	33,248	15,120	16,766	11,980	9,909	4,953	16,759
1983	83,453	49,056	34,397	17,074	18,805	12,745	12,685	2,804	19,340
1984	88,941	55,777	33,164	20,216	17,069	13,624	12,734	2,768	22,530
1985	100,522	63,532	36,990	21,899	22,041	16,741	15,228	2,938	21,675
1986	105,577	65,326	40,251	22,755	25,002	17,535	16,243	3,564	20,478
1987	110,301	68,632	41,669	23,769	25,293	20,715	15,413	3,802	21,309
1988	113,548	68,104	45,444	21,316	29,426	21,514	16,103	3,225	21,964
1989	121,218	71,553	49,665	21,396	31,974	22,635	16,604	3,296	25,313
CONSTANT DOLLARS (1982 = 100)[b]									
1975	$ 55,609	$32,668	$22,942	$12,942	$14,711	$11,906	$ 3,906	$3,104	$ 9,042
1976	54,014	32,902	21,112	14,334	13,141	10,138	4,083	3,160	9,157
1977	53,647	33,340	20,308	14,248	12,126	9,300	4,572	3,573	9,829
1978	58,055	33,468	24,587	13,339	16,179	9,755	5,142	3,222	10,417
1979	63,863	32,225[r]	31,734	11,963	22,162	9,954	5,436	3,678	10,671
1980	72,777	33,218	39,559	11,740	25,027	10,452	8,554	3,249	13,755
1981	77,372	36,548	40,824	13,326	23,813	10,754	9,021	3,743	16,713
1982	75,487	42,239	33,248	15,120	16,766	11,980	9,909	4,953	16,759
1983	79,555	46,765	32,790	16,276	17,927	12,150	12,092	2,673	18,437
1984	78,293	49,099	29,194	17,796	15,026	11,993	11,210[r]	2,437	19,833
1985[b]	90,154	56,979	33,175	19,640	19,768	15,014	13,657	2,635	19,439
1986[b]	94,265	58,327	35,938	20,317	22,323	15,656	14,503	3,182	18,284
1987[b]	98,925	61,553	37,371	21,317	22,684	18,578	13,823	3,410	19,111
1988[b]	100,131	60,056	40,074	18,797	25,949	18,972	14,200	2,844	19,369
1989[b]	101,438	59,877	41,561	17,905	26,756	18,941	13,895	2,758	21,182

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)," Series MA37D (Annually).
a AIA estimate based on M37D data.
b Based on revised aerospace composite price deflator.

ORDERS AND BACKLOG OF MAJOR AEROSPACE COMPANIES AS REPORTED BY THE BUREAU OF THE CENSUS

Calendar Years 1975-1989
(Millions of Dollars)

Year	GRAND TOTAL	TOTAL		Aircraft, Engines, & Parts		Missiles, Space, & Rocket Propulsion	Other Aerospace		Non-Aerospace
		U.S. Gov't.	Other	U.S. Gov't.	Other		U.S. Gov't.	Other	
NET NEW ORDERS									
1975	$ 28,995	$ 18,593	$ 10,402	$ 7,821	$ 6,336	$ 6,082	$ 2,127	$2,068	$ 4,561
1976	35,992	21,056	14,936	9,513	8,410	5,751	2,431	3,241	6,646
1977	38,922	22,682	16,240	9,369	11,193	6,232	3,554	2,170	6,404
1978	49,819	25,992	23,827	11,150	16,961	7,072[b]	4,631	2,450[b]	7,555
1979[a]	67,561[a]	28,107	37,101	8,762	30,695	7,609	5,184	4,487	8,471
1980	69,624	33,496	36,128	16,555	18,123	9,818	8,528	4,081	12,519
1981	74,922	42,431	32,491	16,946	17,911	12,376	9,350	3,250	15,089
1982[a]	89,168[a]	58,849[a]	30,319[a]	20,547	13,591	13,988	13,643	4,762	20,369
1983	91,647	60,290	31,357	22,171	16,428	14,248	15,209	2,641	20,950
1984	104,863	66,968	37,895	25,829	21,273	16,485	14,050	3,461	23,765
1985	110,968	70,240	40,728	23,751	26,191	20,328	14,730[r]	2,800[r]	23,168
1986	110,836	68,001	42,835	21,642	26,315	20,445	16,439	3,907	22,088
1987	121,224	66,264	54,960	17,019	35,328	26,272	13,899	4,658	24,048
1988	147,128	67,850	79,278	19,611	62,537[r]	20,240	18,174	3,293	23,273
1989	176,474	81,727	94,747	25,382	73,906	27,651	18,238	3,772	27,525
BACKLOG AS OF DECEMBER 31									
1975	$ 35,038	$ 22,168	$ 12,870	$10,751	$ 8,141	$ 6,415	$ 1,983	$2,088	$ 5,660
1976	39,702	24,141	15,561	11,950	8,929	6,286	2,046	3,496	6,995
1977	45,309	26,119	19,190	12,471	12,592	6,743	2,761	3,447	7,295
1978	57,160	30,223	26,937	14,897	18,972	7,557	4,029	3,668	8,037
1979[a]	78,548[a]	36,136	42,123	17,316	33,168	7,388	5,613	5,112	9,662
1980	89,732	37,199	52,533	17,435	39,800	8,941	8,421	5,127	10,008
1981	94,710	46,591	48,119	21,292	35,022	11,255	9,052	4,940	13,149
1982[a]	108,391[a]	63,201[a]	45,190[a]	26,644	31,920	13,262	13,268	4,269	16,760
1983	116,585	74,435	42,150	30,688	29,684	14,962	18,489	3,684	19,078
1984	132,507	85,626	46,881	36,312	33,877	17,823	19,684	4,498	20,313
1985	142,953	92,334	50,619	38,150	38,041	21,410	18,937[r]	4,609[r]	21,806
1986	148,212	95,009	53,203	37,041[r]	38,350[r]	24,320	19,133	4,952	23,416
1987	158,650	92,439	66,211	30,323	49,692	30,544	17,888	5,653	24,550
1988	191,518	92,394	99,124	28,412	82,868	29,078	19,822	5,496	25,842
1989	246,317	102,429	144,388	32,398	124,833	34,104	21,456	5,972	28,054

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)," Series MA37D (Annually).
a 1979 and 1982 Orders and Backlog Totals are final revisions for which product group detail is not available.
b AIA estimate based on M37D data.
r Revised.

AEROSPACE SALES AND THE NATIONAL ECONOMY

Calendar Years 1975-1989
(Millions of Dollars)

Year	Gross National Product[a]	Industry Sales			Aerospace Sales As Percent of		
		Manufacturing	Durable Goods	Aerospace	GNP	Manufacturing	Durable Goods
CURRENT DOLLARS							
1975	$1,598.4	$1,039.1	$ 523.9	$ 29.7	1.9%	2.9%	5.7%
1976	1,782.8	1,185.6	608.4	29.8	1.7	2.5	4.9
1977	1,990.5	1,358.4	711.2	32.2	1.6	2.4	4.5
1978	2,249.7	1,522.9	814.2	37.7	1.7	2.5	4.6
1979	2,508.2	1,727.2	912.7	45.4	1.8	2.6	5.0
1980	2,732.0	1,852.7	930.6	54.7	2.0	3.0	5.9
1981	3,052.6	2,017.5	1,006.5	64.0	2.1	3.2	6.4
1982	3,166.0	1,960.2[r]	952.2[r]	67.8	2.1	3.5	7.1[r]
1983	3,405.7	2,054.9[r]	1,019.5[r]	80.0	2.3	3.9	7.8
1984	3,772.2	2,254.4[r]	1,188.2[r]	83.5	2.2	3.7	7.0[r]
1985	4,014.9	2,280.2[r]	1,199.9[r]	96.6	2.4	4.2	8.1
1986	4,231.6[r]	2,260.3[r]	1,201.7	106.2	2.5	4.7	8.8
1987	4,515.6[r]	2,390.0	1,263.5	110.0	2.4	4.6	8.7
1988	4,873.7[r]	2,611.6	1,388.2	114.6	2.4[r]	4.4	8.3
1989	5,200.8	2,781.6	1,471.5	117.6	2.3	4.2	8.0
CONSTANT DOLLARS (1982 = 100)[b]					**Real Annual Growth[c]**		
					GNP	Mfg.	Durs.	Aero.
1975	$2,695.0	$1,752.3	$ 883.5	$ 56.0	(1.2)%	(7.0)%	(10.1)%	(3.8)%
1976	2,826.7	1,878.9	964.2	51.4	4.9[r]	7.2	9.1	(8.2)
1977	2,958.6	2,018.4	1,056.8	51.9	4.7	7.4	9.6	1.0
1978	3,115.2	2,109.3	1,127.7	57.6	5.3	4.5	6.7	11.0
1979	3,192.4	2,197.5	1,161.2	62.8	2.5[r]	4.2	3.0	9.0
1980	3,187.1	2,161.8	1,085.9	68.1	(0.2)[r]	(1.6)	(6.5)	8.4
1981	3,248.8	2,146.3	1,070.7	70.8	1.9	(0.7)	(1.4)	4.0
1982[r]	3,166.0	1,960.2	952.2	67.8	(2.5)	(8.7)	(11.1)	(4.2)
1983[r]	3,279.1	1,977.8	981.2	76.3	3.6	0.9	3.0	12.5
1984[r]	3,501.4	2,093.2	1,103.2	73.5	6.8	5.8	12.4	(3.7)
1985[r]	3,618.7	2,056.1	1,082.0	86.6	3.4	(1.8)	(1.9)	17.8
1986[r]	3,717.9	1,986.2	1,056.0	94.8	2.7	(3.4)	(2.4)	9.5
1987[r]	3,845.3	2,035.8	1,076.2	98.7	3.4	2.5	1.9	4.1
1988[r]	4,016.9	2,153.0	1,144.4	101.1	4.5	5.8	6.3	2.4
1989	4,117.7	2,200.6	1,164.2	98.4	2.5	2.2	1.7	(2.7)

Source: Bureau of Economic Analysis, "Business Statistics" and "Survey of Current Business" (Monthly); and Aerospace Industries Association.

NOTE: See Glossary for explanation of "Aerospace Sales."

a Calendar year GNP figures have been changed to reflect revisions to the National Income and Product Accounts (NIPA).

b "Aerospace" based on aerospace composite price deflator. "Manufacturing" and "Durable Goods" based on GNP implicit price deflator. Real GNP insignificantly revised to match published constant dollar figures.

c Parentheses indicate negative real annual growth.

r Revised.

GROSS NATIONAL PRODUCT, FEDERAL BUDGET, AND DEFENSE BUDGET

Fiscal Years 1961 - 1991
(Billions of Dollars)

Year	Fiscal Year GNP	Federal Budget Outlays		Defense Outlays as Percent of	
		Net Total[a]	National Defense[b]	GNP	Federal Budget
1961	$ 518.2	$ 97.7	$ 49.6	9.6%	50.8%
1962	557.7	106.8	52.3	9.4	49.0
1963	587.8	111.3	53.4	9.1	48.0
1964	629.2	118.5	54.8	8.7	46.2
1965	672.6	118.2	50.6	7.5	42.8
1966	739.0	134.5	58.1	7.9	43.2
1967	794.6	157.5	71.4	9.0	45.4[r]
1968	849.4	178.1	81.9	9.6	46.0
1969	929.5	183.6	82.5	8.9	44.9
1970	990.2	195.6	81.7	8.3	41.8
1971	1,055.9	210.2	78.9	7.5	37.5
1972	1,153.1	230.7	79.2	6.9	34.3
1973	1,281.4	245.7	76.7	6.0	31.2
1974	1,416.5	269.4	79.3	5.6	29.5[r]
1975	1,522.5	332.3	86.5	5.7	26.0
1976	1,698.2	371.8	89.6	5.3	24.1
Tr.Qtr.	448.7	96.0	22.3	5.0	23.2
1977	1,933.0	409.2	97.2	5.0	23.8
1978	2,171.8	458.7	104.5	4.8	22.8
1979	2,447.8	503.5	116.3	4.8[r]	23.1
1980	2,670.6	590.9	134.0	5.0	22.7
1981	2,986.4	678.2	157.5	5.3	23.2
1982	3,139.1	745.7	185.3	5.9	24.9[r]
1983	3,321.9	808.3	209.9	6.3	26.0
1984	3,687.7	851.8	227.4	6.2	26.7
1985	3,952.4	946.3	252.7	6.4	26.7
1986	4,180.9[r]	990.3	273.4	6.5	27.6
1987	4,430.2[r]	1,003.8	282.0	6.4	28.1
1988	4,792.2[r]	1,064.0	290.4	6.1	27.3
1989	5,151.3	1,142.6	303.6	5.9	26.6
1990[E]	5,488.9	1,197.2	296.3	5.4	24.8
1991[E]	5,892.4	1,233.3	303.3	5.1	24.6

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually).
a "Net Total" is government-wide total less intragovernmental transactions.
b "National Defense" includes the military budget of DOD and other defense-related activities. Beginning in FY 1985, the Federal Budget reflects establishment of a military retirement trust fund. Data for prior years adjusted for comparable treatment of military retired pay.
E Estimate.
r Revised.
Tr.Qtr. See Glossary.

FEDERAL OUTLAYS
DEFENSE, NASA, AND AEROSPACE PRODUCTS & SERVICES

Fiscal Years 1963 - 1991
(Millions of Dollars)

Year	TOTAL National Defense	NASA	Federal Outlays for Aerospace Products & Services			Aerospace as Percent of Total National Defense and NASA
			TOTAL	DOD[a]	NASA	
1963	$ 53,400	$ 2,552	$12,453	$10,126	$ 2,327	22.3%
1964	54,757	4,171	13,363	9,630	3,733	22.7
1965	50,620	5,093	11,858	7,296	4,562r	21.3
1966	58,111	5,933	14,065r	8,704	5,361r	22.0
1967	71,417	5,426	15,478	10,341	5,137	20.1
1968	81,926	4,724	16,279	11,681	4,598	18.8
1969	82,497	4,252r	15,872r	11,686	4,186r	18.3
1970	81,692	3,753	14,559	10,860	3,699	17.0
1971	78,872	3,382	12,918r	9,580r	3,338	15.7r
1972	79,174	3,423r	12,309r	8,936	3,373r	14.9
1973	76,681	3,315	11,360r	8,089	3,271r	14.2
1974	79,347	3,256	11,168	7,987	3,181	13.5
1975	86,509	3,267r	11,544r	8,373	3,181	12.9
1976	89,619	3,669	12,364	8,816	3,548	13.3
Tr.Qtr.	22,269	951r	2,855	1,959	926	12.3
1977	97,241	3,945	13,229	9,389	3,840	13.1
1978	104,495	3,983	13,926	10,067	3,859	12.8
1979	116,342	4,197r	16,686	12,622	4,064	13.8
1980	133,995	4,852	20,269r	15,558	4,711r	14.6
1981	157,513	5,421r	24,276r	19,002	5,274r	14.9
1982	185,309	6,035	29,501	23,575	5,926	15.4
1983	209,903	6,664	35,364	28,808	6,556	16.3
1984	227,413	7,048	39,663r	32,723	6,940r	16.9
1985	252,748	7,318r	44,483r	37,335	7,148r	17.1
1986	273,375	7,404r	49,773	42,558	7,215	17.7
1987	281,999	7,591	51,871	44,429	7,442	17.9
1988	290,361	9,091	48,848	39,922	8,926	16.3
1989	303,559	11,052	52,933	42,072	10,861	16.8
1990E	296,342	12,026	52,895	41,110	11,785	17.2
1991E	303,251	14,137	54,533	40,767	13,766	17.2

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually); Department of Defense, "Status of Funds" (Annual Summaries); and NASA "Pocket Statistics" (Annually)..

NOTE: "National Defense" includes the military budget of the Department of Defense and other defense-related activities. "TOTAL NASA" includes all categories of the NASA budget; NASA construction is not included in "Aerospace Products and Services." See additional explanation with following table.

a Outlays for aircraft and missile procurement. Does not include RDT&E, which DOD has not reported by product group since 1977, and which, for comparability, has been subtracted from data previously reported in this table for earlier years. Also included are revisions to missile procurement data.

E Estimate. Latest year reflects Administration's budget proposal.

r Revised.

Tr.Qtr. See Glossary.

FEDERAL OUTLAYS FOR AEROSPACE PRODUCTS AND SERVICES

Fiscal Years 1963 - 1991
(Millions of Dollars)

Year	TOTAL	Department of Defense[a]			NASA[b]
		TOTAL	Aircraft	Missiles[c]	
1963	$12,453	$10,126	$ 3,609	$ 3,817	$ 2,327
1964	13,363	9,630	6,053	3,577	3,733
1965	11,858	7,296	5,200	2,096	4,562
1966	14,065r	8,704	6,635	2,069	5,361r
1967	15,478	10,341	8,411	1,930	5,137
1968	16,279	11,681	9,462	2,219	4,598
1969	15,872r	11,686	9,177	2,509	4,186r
1970	14,559	10,860	7,948	2,912	3,699
1971r	12,918	9,580	6,549	3,031	3,338
1972	12,309r	8,936	5,927	3,009	3,373r
1973	11,360r	8,089	5,066	3,023	3,271r
1974	11,168	7,987	5,006	2,981	3,181
1975	11,554	8,373	5,484	2,889	3,181
1976	12,364	8,816	6,520	2,296	3,548
Tr.Qtr.	2,885	1,959	1,557	402	926
1977	13,229	9,389	6,608	2,781	3,840
1978	13,926	10,067	6,971	3,096	3,859
1979	16,686	12,622	8,836	3,786	4,064
1980	20,269r	15,558	11,124	4,434	4,711r
1981	24,276r	19,002	13,193	5,809	5,274r
1982	29,501	23,575	16,793	6,782	5,926
1983	35,364	28,808	21,013	7,795	6,556
1984	39,663r	32,723	23,196	9,527	6,940r
1985	44,483r	37,335	26,586	10,749	7,148r
1986	49,773	42,558	30,828	11,730	7,215
1987	51,871	44,429	32,956	11,473	7,442
1988	48,848	39,922	28,246	11,676	8,926
1989	52,933	42,072	27,569	14,503	10,861
1990E	52,895	41,110	27,247	13,864	11,785
1991E	54,533	40,767	26,677	14,089	13,766

Source: Department of Defense, "Status of Funds" (Annual Summaries); Office of Management and Budget, "The Budget of the United States Government" (Annually); and NASA, "Pocket Statistics" (Annually).

a Outlays for aircraft and missile procurement. Does not include RDT&E, which DOD has not reported by product group since 1977, and which for comparability, has been subtracted from data previously reported in this table for earlier years.

b Includes Research & Development and Research & Program Management, and effective with 1984 data, Space Flight, Control and Data Communications; excludes Construction of Facilities.

c 1978 and subsequent years revised by AIA from previously published data to include Navy Weapons Procurement in Missiles Procurement. Beginning 1978, DOD combined Navy Missile Procurement with torpedoes and other related products into Navy Weapons Procurement, of which missiles comprise approximately 80 percent.

E Estimate. Latest year reflects Administration's budget proposal.

r Revised.

Tr.Qtr. See Glossary.

DEPARTMENT OF DEFENSE
TOTAL MILITARY OUTLAYS BY FUNCTIONAL TITLE[a]

Fiscal Years 1982–1991
(Millions of Dollars)

	1982	1983	1984
TOTAL[d]	$180,714	$204,410	$220,928
Procurement-TOTAL	43,271	53,624	61,879
Aircraft	16,793	21,013	23,196
Missiles[b]	6,782	7,795	9,527
Ships	6,739	7,504	8,487
Weapons[b]	2,144	3,420	3,691
Ammunition	1,647	1,966	1,826
Communications & Electronics[c]	2,733		
Other	6,433	11,926	15,152
Military Personnel—TOTAL	55,170	60,886	64,158
Active Forces	38,522	41,015	42,732
Reserve Forces	3,818	4,508	4,923
Retired Pay	14,938	15,945	16,503
Adjustment: Retirement Trust Fund Accrual[d]	(2,109)	(583)	(2)
Research, Development, Test, & Evaluation	17,729	20,554	23,117
Operations & Maintenance	59,695	64,932	67,388
Military Construction	2,922	3,524	3,706
Family Housing	1,993	2,126	2,413
Other	(65)	(1,236)	(1,732)

Source: Department of Defense, "Status of Funds" (Annual Summaries) and Office of Management and Budget, "The Budget of the United States Government" (Annually).

NOTE: Data in parentheses are credit items. Detail may not add to totals because of rounding.

[a] Includes all items in the DOD military budget; excludes the DOD civil budget for the Army Corps of Engineers and other non-defense related activities.

[b] Beginning in 1978, DOD combined Navy Missiles Procurement with torpedoes and other related products into Navy Weapons Procurement. Missiles comprise approximately 80 pecent of the value of this category.

[c] Not available as separate item after 1982; included in Other Procurement.

[d] Beginning in FY 1985, the Federal Budget reflects establishment of a military retirement trust fund. Data for previous years have been adjusted on a comparable basis.

[E] Estimate. Latest year reflects Administration's budget proposal.

[r] Revised.

DEPARTMENT OF DEFENSE
TOTAL MILITARY OUTLAYS BY FUNCTIONAL TITLE[a] (Continued)

Fiscal Years 1982–1991
(Millions of Dollars)

1985	1986	1987	1988	1989	1990[E]	1991[E]
$245,154	$265,480	$273,966	$281,935	$294,880	$286,791	$292,145
70,381	76,517	80,744	77,166	81,620	80,948	79,344
26,586	30,828	32,956	28,246	27,569	27,247	26,677
10,749	11,730	11,473	11,676	14,503	13,864	14,089
9,145	9,501	9,316	8,878	10,587	11,050	10,983
3,801	4,343	4,962	4,727	4,384	4,026	3,812
2,080	1,933	2,111	2,250	1,993	2,281	1,771
} 18,020	} 18,182	} 19,926	} 21,389	} 22,585	} 22,481	} 22,012
67,842	71,511	72,020	76,337	80,676	75,259	78,793
60,344	63,139	63,810	67,642	71,571	66,384	69,480
7,498	8,373	8,210	8,694	9,104	8,875	9,313
(d)	(d)	(d)	(d)	(d)	(d)	(d)
—	—	—	—	—	—	—
27,103	32,283	33,596	34,792	37,002	36,527	36,969
72,371	75,288	76,205	84,475	87,001	86,133	88,328
4,260	5,067	5,853	5,874	5,275	5,420	5,490
2,642	2,819	2,908	3,082	3,257	3,393	3,474
533	1,995	2,640	208	50	(888)	(252)

FEDERAL PRICE DEFLATORS FOR GNP, DEFENSE, PPI, and CPI

(1962-1991)

Year	GNP		Federal Government Defense Purchases		PPI, Capital Equip-ment	CPI, (Urban) All Items
	FY GNP (FY 1982 = 100)	CY GNP (CY 1982 = 100)	Durable Goods (FY 1982 = 100)	Goods & Services (CY 1982 = 100)	(CY 1982 = 100)	(CY 82-84 = 100)
1962	32.00	31.9	NA	NA	33.0	30.2
1963	32.58	32.4	NA	NA	33.1	30.6
1964	33.05	32.9	NA	NA	33.4	31.0
1965	33.75r	33.8	NA	NA	33.8	31.5
1966	34.74	35.0	NA	NA	34.6	32.4
1967	35.93	35.9	NA	NA	35.8	33.4
1968	37.19	37.7	NA	NA	37.0	34.8
1969	39.20	39.8	NA	NA	38.3	36.7
1970	41.48	42.0	NA	NA	40.1	38.8
1971	43.66	44.4	NA	NA	41.7	40.5
1972	46.06	46.5	48.5	41.8	42.8	41.8
1973	48.35	49.5	49.4	45.3	44.2	44.4
1974	52.16	54.0	51.6	50.6	50.5	49.3
1975	57.52	59.3	56.0	55.6	58.2	53.8
1976	62.08	63.1	59.6	59.3	62.1	56.9
1977	67.03	67.3	63.9	63.4	66.1	60.6
1978	71.72	72.2	67.3	67.8	71.3	65.2
1979	77.90	78.6	73.2	74.2	77.5	72.6
1980	84.74	85.7	81.1	83.4	85.8	82.4
1981	93.21r	94.0	90.8	92.9	94.6	90.9
1982	100.00	100.0	100.0	100.0	100.0	96.5
1983	104.23	103.9	104.3	103.6	102.8	99.6
1984	108.19	107.7	108.4	107.2	105.2	103.9
1985	111.53	111.0r	108.0	109.2	107.5	107.6
1986	114.51r	113.8r	108.8	110.2r	109.7	109.6
1987	118.03r	117.4r	104.0	111.1r	111.7	113.6
1988	121.62	121.3	100.5	114.0	114.3	118.3
1989p	126.74	126.4	101.8	117.5	118.8	124.0
1990E	131.90	131.7	NA	NA	NA	NA
1991E	137.51	137.2	NA	NA	NA	NA

Source: Bureau of Economic Analysis, "Current Business Statistics" (Monthly) and Price Measurement Branch; Council of Economic Advisers, "Economic Report of the President" (Annually); and Office of Management and Budget, "The Budget of the United States Government" (Annually).

E Estimate.

NA Not Available.

p Preliminary.

r Revised.

Key: CY = Calendar Year.
PPI = Producer Price Index for Capital Equipment.
CPI = Consumer Price Index, All items, All Urban Consumers for 1978 and subsequent years. Previous years, All Urban Wage Earners.

FEDERAL PRICE DEFLATORS FOR AEROSPACE INDUSTRY

Calendar Years 1965-1989

Year	Aerospace Deflators[a] (CY 1982 = 100)						
	Composite	SIC 3721	SIC 3724	SIC 3728	SIC 3761	SIC 3764	SIC 3769
1965	30.3	31.4	27.8	31.9	30.5	27.4	28.3
1966	31.2	35.7	28.5	32.8	31.9	28.1	29.2
1967	32.3	33.1	29.3	33.6	33.4	29.0	30.1
1968	33.3	34.2	29.9	34.5	34.8	29.5	31.0
1969	34.6	35.6	31.3	35.6	36.1	30.9	32.4
1970	36.6	37.7	32.9	37.4	38.1	32.5	34.2
1971	38.0	39.3	34.2	38.8	39.7	33.7	35.7
1972	38.4	44.5	35.3	43.4	42.5	35.4	38.1
1973	42.9	45.9	36.3	45.2	42.2	36.6	39.5
1974	47.2	49.9	41.0	52.2	44.5	41.7	44.0
1975	53.0	53.8	49.6	61.2	48.4	50.6	52.2
1976	58.0	58.8	53.9	67.0	53.9	55.4	56.7
1977	62.1	62.6	57.6	69.6	59.5	59.9	61.4
1978	65.4	66.1	64.1	65.5	65.0	65.4	66.1
1979	72.3	72.8	71.5	69.9	74.6	72.0	72.7
1980	80.3	81.2	77.8	77.4	84.4	80.8	80.9
1981	90.4	90.0	90.4	88.8	93.2	92.1	89.5
1982	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1983	104.9	105.2	105.0	104.2	105.5	104.4	102.8
1984	113.6	118.0	115.1	111.0	107.8	105.9	110.8
1985	111.5[r]	112.2	116.4	112.0	109.6	106.2	116.5
1986	112.0[r]	112.1[r]	116.5	116.1	108.6	107.6	116.9
1987	111.5	111.4	117.3	118.6	105.5	104.5	113.5
1988[p]	113.4	113.9	120.8	122.8	104.8	103.9	112.8
1989[E]	119.5	123.5	124.1	126.7	104.4	103.4	112.4

Source: Aerospace Industries Association, based on data from: Bureau of Labor Statistics, Producer Price Indices; Bureau of Economic Analysis, Implicit Price Deflators; and International Trade Administration.

NOTE: Beginning in 1987 deflators for SICs 3761, 3764, & 3769 based on SIC 376.

a The Commerce Department has discontinued its reporting of the Aerospace Deflators with 1986. AIA has computed the latest years and revised years since 1985 for consistency.

E Estimate.

p Preliminary.

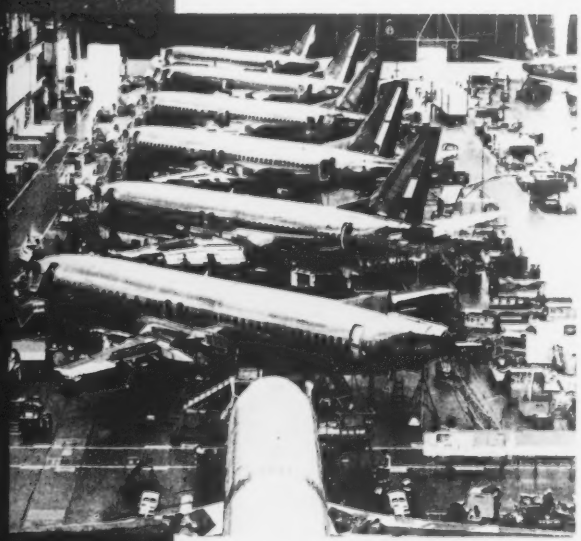
r Revised.

Key: SIC = Standard Industrial Classification; SIC 3721 = Aircraft; SIC 3724 = Aircraft Engines and Engine Parts; SIC 3728 = Aircraft Parts; SIC 3761 = Missiles and Space Vehicles; SIC 3764 = Space Propulsion; SIC 3769 = Space Equipment not elsewhere classified.

AIRCRAFT PRODUCTION

90-91

Although the number of U.S. commercial transports sold during 1989 declined slightly from the previous year, and despite a significant decline in the dollar value of military aircraft sales, U.S. sales of aircraft, engines, and parts reached another all-time high last year. Total sales of aircraft, engines, and parts amounted to $53.4 billion in 1989, compared with $50.7 billion in 1988.



Based on civil shipments and military acceptances, the U.S. aerospace industry produced 3,675 aircraft of all types in 1989, 2,448 of them civil aircraft and 1,227 military. In 1988, the industry produced 3,254 aircraft, of which 1,949 were for civil and 1,305 for military use.

New orders for aircraft, engines, and parts in 1989 once again set a record for the largest total dollar volume in the history of the aerospace industry—$99.3 billion, some 20 percent higher than the 1988 figure of $82.1, which was the previous record. Despite declining real defense budget authority in each of the past four fiscal years, orders for aircraft, engines, and parts from the U.S. government—principally military aircraft—increased to $25.4 billion, up from $19.6 billion in 1988. Non-U.S. government orders for aircraft, engines, and parts, principally orders from domestic and foreign airlines for civil transports, increased significantly as well, to $73.9 billion in 1989—an 18 percent rise over the 1988 level of $62.5 billion.

Total backlog of orders for aircraft, engines, and parts, as of yearend 1989, increased significantly—41 percent—to $157.2 billion, up from $111.3 billion at the end of 1988. The composition of the backlog was $32.4 billion in U.S.

government orders (up from $28.4 billion in 1988) and $124.8 billion in non-U.S. government orders (compared with $82.9 billion in 1988—the previous record for non-U.S. government orders).

Among other 1989 aircraft production highlights:

■ Commercial transport sales increased sharply for the fifth straight year, driving up total civil aircraft sales to $17.1 billion (up from $15.9 billion in 1988). The new industry record for sales of commercial transport aircraft, $15.1 billion in 1989, represented a more than 10 percent increase over the previous year total of $13.6 billion. In numerical terms, however, the industry delivered slightly fewer transports in 1989 than in the previous year—398 compared to 423. The backlog for commercial transports at the end of 1989 included orders for 1,989 aircraft worth $89.1 billion; this compared with 1,373 planes valued at $58.5 billion at the end of 1988.

■ Sales of general aviation planes were at $1.8 billion in 1989, down slightly from the 1988 total of $1.9 billion. Unit shipments, however, increased from 1,143 in 1988 to 1,535 in 1989.

■ The dollar value of civil helicopter sales also declined in 1989 to $251 million compared with $334 million in 1988. The number of helicopters shipped during 1989 increased, however, to 515 units; the comparable figure for 1988 was 383 units.

■ In unit terms, more than half (1,336) of the 2,448 aircraft produced in 1989 were delivered to domestic customers. General aviation deliveries to domestic customers numbered 977 planes, compared with 558 units exported; transports—138 delivered in the U.S., 260 exported; helicopters—221 domestic sales, 294 shipped abroad.

■ The industry produced 1,227 military aircraft in 1989, down slightly from the 1,305 units delivered in 1988. This is indicative of the trend in recent years of declining Department of

Defense outlays for aircraft procurement. DoD reported aircraft procurement outlays of $27.6 billion in Fiscal Year 1989. DoD estimated outlays of $27.2 billion in FY 1990 and $26.7 billion in FY 1991.

■ The 1,227 military aircraft produced included 580 delivered to U.S. military agencies for internal use and 647 units exported; the latter number included 81 aircraft sold under Foreign Military Sales (FMS) programs and 566 exported directly from U.S. manufacturers to foreign governments.

The 661 aircraft accepted by U.S. military agencies (580 units plus 81 FMS aircraft) were 20 percent fewer than the 825 units delivered in the previous year; total flyaway value of the aircraft was $9.4 billion, down substantially from the previous year's $16 billion.

The 647 military aircraft exported represented a dramatic upturn in the number of units sold directly from U.S. manufacturers to foreign governments; 566 aircraft were shipped directly to foreign governments in 1989, compared with 480 units the previous year. Foreign Military Sales programs accounted for 81 aircraft sold in 1989, down from 138 units in 1988. Correspondingly, FMS declined to $1.5 billion in 1989 from $2.2 billion in 1988.

SALES OF AIRCRAFT, ENGINES, AND PARTS

Calendar Years 1975-1989
(Millions of Dollars)

Year	GRAND TOTAL	TOTAL		Complete Aircraft & Parts		Aircraft Engines & Parts	
		U.S. Gov't.	Other	U.S. Gov't.	Other	U.S. Gov't.	Other
CURRENT DOLLARS							
1975	$14,656	$ 6,859	$ 7,797	$ 5,269	$ 6,001	$1,590	$1,796
1976	15,936	8,314	7,622	6,336	5,900	1,978	1,722
1977	16,378	8,848	7,530	6,855	5,670	1,993	1,860
1978	19,305	8,724	10,581	6,853	7,873	1,871	2,708
1979	24,672	8,649	16,023	6,378	12,701	2,271	3,322
1980	29,524	9,427	20,097	6,724	15,901	2,703	4,196
1981	33,574	12,047	21,527	8,197	16,877	3,850	4,650
1982	31,886	15,120	16,766	10,903	12,316	4,217	4,450
1983	35,879	17,074	18,805	12,898	14,419	4,176	4,386
1984	37,285	20,216	17,069	15,136	13,121	5,080	3,948
1985	43,940	21,899	22,041	17,783	16,466	4,116	5,575
1986	47,757	22,755	25,002	18,788	19,177	3,967	5,825
1987	49,062	23,769	25,293	18,131	18,899	5,638	6,394
1988	50,742	21,316	29,426	15,278	20,433	6,038	8,993
1989	53,370	21,396	31,974	15,365	22,576	6,031	9,398
CONSTANT DOLLARS (1982 = 100)[a]							
1975	$27,653	$12,942	$14,711	$ 9,942	$11,323	$3,000	$3,389
1976	27,476	14,334	13,141	10,924	10,172	3,410	2,969
1977	26,374	14,248	12,126	11,039	9,130	3,209	2,995
1978	29,518	13,339	16,179	10,479	12,038	2,861	4,141
1979	34,124	11,963	22,162	8,822	17,567	3,141	4,595
1980	36,767	11,740	25,027	8,374	19,802	3,366	5,225
1981	37,139	13,326	23,813	9,067	18,669	4,259	5,144
1982	31,886	15,120	16,766	10,903	12,316	4,217	4,450
1983	34,203	16,276	17,927	12,296	13,745	3,981	4,181
1984	32,821	17,796	15,026	13,324	11,550	4,472	3,475
1985[a]	39,408	19,640	19,768	15,949	14,768	3,691	5,000
1986[a]	42,640	20,317	22,323	16,775	17,122	3,542	5,201
1987[a]	44,002	21,317	22,684	16,261	16,950	5,057	5,735
1988[a]	44,746	18,797	25,949	13,473	18,019	5,325	7,930
1989	44,661	17,905	26,756	12,858	18,892	5,047	7,864

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)" Series MA37D (Annually).
a Based on revised aerospace composite price deflator.

ORDERS AND BACKLOG OF AIRCRAFT, ENGINES, AND PARTS

Calendar Years 1975-1989
(Millions of Current Dollars)

Year	GRAND TOTAL	TOTAL		Complete Aircraft & Parts		Aircraft Engines & Parts	
		U.S. Gov't.	Other	U.S. Gov't.	Other	U.S. Gov't.	Other
NET NEW ORDERS							
1975	$ 14,157	$ 7,821	$ 6,336	$ 6,314	$ 4,758[a]	$1,507	$ 1,578[a]
1976	17,923	9,513	8,410	7,498	6,316[a]	2,015	2,094[a]
1977	20,562	9,369	11,193	6,507	8,406	2,862	2,787
1978	28,111	11,150	16,961	9,055	14,229	2,095	2,732
1979	39,457	8,762	30,695	8,762	25,084[a]	2,348	5,611[a]
1980	34,678	16,555	18,123	11,606	14,427	4,949	3,696
1981	34,857	16,946	17,911	11,760	12,621	5,186	5,290
1982	34,138	20,547	13,591	15,978	10,540	4,569	3,051
1983	38,599	22,171	16,428	17,402	11,688	4,769	4,740
1984	47,102[r]	25,829	21,273[r]	19,228	18,148[r]	6,601	3,125
1985	49,942	23,751	26,191	20,062	20,153	3,689	6,038
1986	47,957	21,642	26,315	17,361	20,083	4,281	6,232
1987	52,347	17,019	35,328	12,742	26,411	4,277	8,917
1988	82,148	19,611	62,537	12,862	46,393	6,749	16,144
1989	99,288	25,382	73,906	19,615	59,148	5,767	14,758
BACKLOG AS OF DECEMBER 31							
1975	$ 18,892	$10,751	$ 8,141	$ 8,743	$ 6,646	$2,008	$ 1,495
1976	20,879	11,950	8,929	9,905	7,416	2,045	1,513
1977	25,063	12,471	12,592	9,557	10,152	2,914	2,440
1978	33,869	14,897	18,972	11,759	16,508	3,138	2,464
1979	50,484	17,316	33,168	13,331	27,955	3,985	5,213
1980	57,235	17,435	39,800	12,702	33,258	4,733	6,542
1981	56,314	21,292	35,022	15,626	27,683	5,666	7,339
1982	58,564	26,644	31,920	20,626	25,980	6,018	5,940
1983	60,372	30,688	29,684	24,091	23,377	6,597	6,307
1984	70,189[r]	36,312	33,877[r]	28,183	28,404[r]	8,129	5,473
1985	76,191	38,150	38,041	30,462	32,091	7,688	5,950
1986	76,391	37,041	39,350	29,035	32,997	8,006	6,353
1987	80,015	30,323	49,692	23,645	40,849	6,678	8,843
1988	111,280	28,412	82,868	21,083	66,782	7,329	16,086
1989	157,231	32,398	124,833	25,333	103,387	7,065	21,446

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)" Series MA37D (Annually).
a AIA estimate, based on MQ37D data.
r Revised.

U.S. AIRCRAFT PRODUCTION—CIVIL

Calendar Years 1969-1989

Year	TOTAL	Domestic Shipments			Export Shipments		
		Transports[a]	Helicopters	General Aviation	Transports	Helicopters	General Aviation
1969	13,505	332	282	9,996	182	252	2,461
1970	8,076	127	150	5,246	184	332	2,037
1971	8,158	50	171	5,900	173	298	1,566
1972	10,576	79	319	7,702	148	256	2,072
1973	14,709	143	342	10,482	151	428	3,163
1974	15,326	91	433	9,903	241	395	4,263
1975	15,251	127	528	10,804	188	336	3,268
1976	16,429	64	442	12,232	158	315	3,218
1977	17,913	54	527	13,441	101	321	3,469
1978	18,962	130	536	14,346	111	368	3,471
1979	18,460	176	570	13,177	200	459	3,878
1980	13,634	150	841	8,703	237	525	3,178
1981	10,916	132	619	6,840	255	453	2,617
1982	5,085	111	333	3,326	121	254	940
1983	3,356	133	187	2,172	129	216	519
1984	2,999	102	143	2,013	83	233	425
1985	2,691[r]	126	247[r]	1,545	152	137	484
1986	2,151	171	116	1,031	159	210	464
1987	1,800	187	116[r]	598[r]	170	242[r]	487[r]
1988	1,949	206	103	500	217	280	643
1989	2,448	138	221	977	260	294	558

Source: Aerospace Industries Association, based on company reports; General Aviation Manufacturers Association; and Department of Commerce, International Trade Administration.

a Prior to 1976, includes the C-130 military transport.

U.S. AIRCRAFT PRODUCTION—MILITARY

Calendar Years 1969-1989

Year	MILITARY AIRCRAFT				
	TOTAL	U.S. Military Agencies	Exports		
			Total	FMS[a]	Direct[b]
1969	4,290	3,644	646	NA	NA
1970	3,720	3,085	635	NA	NA
1971	2,914	2,232	682	NA	NA
1972	2,530	1,993	537	124	413
1973	1,821	1,243	578	129	449
1974	1,513	799	714	365	349
1975	1,779	844	935	525	410
1976	1,318	625	693	518	175
1977	1,134	454	680	408	272
1978	996	467	529	256	273
1979	837	531	306	203	103
1980	1,047	625	422	194	228
1981	1,062	703	359	215	144
1982	1,159	690	469	68	401
1983	1,053	766	287	70	217
1984	936	561	375	71	304
1985	919	643	276	134	142
1986	1,107	708	399	110	289
1987	1,210[r]	725[r]	485	133	352
1988	1,305[r]	687[r]	618	138	480
1989	1,227	580	647	81	566

Source: Aerospace Industries Association, based on USAF, USN, and USA survey responses and Department of Commerce, International Trade Association.

a Also includes acceptances of NATO AWACs aircraft.

b Military aircraft exported via commercial contracts, directly from manufacturers to foreign governments.

NA Not available.

r Revised.

CIVIL AIRCRAFT SHIPMENTS

Calendar Years 1975-1989

Year	TOTAL	Transport Aircraft[a]	Helicopters	General Aviation
NUMBER OF AIRCRAFT SHIPPED				
1975	15,251	315	864	14,072
1976	16,429	222	757	15,450
1977	17,913	155	848	16,910
1978	18,962	241	904	17,817
1979	18,460	376	1,029	17,055
1980	13,634	387	1,366	11,881
1981	10,916	387	1,072	9,457
1982	5,085	232	587	4,266
1983	3,356	262	403	2,691[b]
1984	2,999	185	376	2,438
1985	2,691[r]	278	384[r]	2,029
1986	2,151	330	326	1,495
1987	1,800	357	358	1,085
1988	1,949	423	383	1,143
1989	2,448	398	515	1,535
VALUE—Millions of Dollars				
1975	$ 5,086	$ 3,779	$ 274	$1,033
1976	4,592	3,078	285	1,229
1977	4,451	2,649	251	1,551
1978	6,458	4,308	328	1,822
1979	10,644	8,030	403	2,211
1980	13,058	9,895	656	2,507
1981	13,223	9,706	597	2,920
1982	8,610	6,246	365	1,999
1983	9,773	8,000	303	1,470[b]
1984	7,717	5,689	330	1,698
1985	10,385[r]	8,448	506[r]	1,431
1986	11,857	10,308	287	1,262
1987	12,148	10,507	277	1,364
1988	15,855	13,603	334	1,918
1989	17,129	15,074	251	1,804

Source: Aerospace Industries Association, based on company reports and General Aviation Manufacturers' Association.

a U.S.-manufactured fixed-wing aircraft over 33,000 pounds empty weight, including all jet transports plus the four-engine turboprop-powered Lockheed L-100.

b Includes 3 off-the-shelf Gulfstream G-III's delivered to the U.S. Air Force for C-20 VIP transports.

r Revised.

CIVIL TRANSPORT AIRCRAFT BACKLOG[a]

As of December 31, 1985–1989

Company and Model	1985	1986	1987	1988	1989
TOTAL AIRCRAFT ON ORDER					
(Domestic and Foreign Orders)	662	660	824	1,373	1,989
Value (Millions of Dollars)	$19,519	$22,264	$32,401	$58,474	$89,069
Boeing-TOTAL	472	451	573	937	1,440
B-737	304	269	342	488	739
B-747	51	84	120	153	165
B-757	77	63	67	205	344
B-767	40	35	44	91	192
Lockheed-TOTAL	2	—	2	1	—
L-100	2	—	2	1	—
McDonnell Douglas-TOTAL	188	209	249	435	549
MD-11	—	—	29	88	126
MD-80	180	203	213	346	423
DC-10	8	6	7	1	—
TOTAL FOREIGN ORDERS	252	293	420	840	1,092
Value (Millions of Dollars)	$7,929	$12,467	$20,196	$39,504	$54,956
Boeing-TOTAL	158	192	293	547	750
B-737	98	93	137	263	359
B-747	38	68	95	124	141
B-757	8	9	28	91	119
B-767	16	22	33	69	131
Lockheed-TOTAL	2	—	2	—	—
L-100	2	—	2	—	—
McDonnell Douglas-TOTAL	90	101	125	293	342
MD-11	—	—	27	75	96
MD-80	90	99	95	217	246
DC-10	—	2	3	1	—

Source: Aerospace Industries Association, based on company reports.

a Unfilled firm orders for U.S. manufactured transport aircraft over 30,000 pounds (including the turboprop powered Lockheed L-100) excluding options, but including new transports contracted for lease from the manufacturer.

SHIPMENTS OF CIVIL TRANSPORT AIRCRAFT[a]

Calendar Years 1985–1989

Company and Model	1985	1986	1987	1988	1989
TOTAL					
Number of Aircraft Shipped	278	330	357	423	398
Value (Millions of Dollars)	$8,500	$10,308	$10,507	$13,690r	$15,074
Boeing-TOTAL	200	238	257	289	279
B-737	115	141	161	165	146
B-747	24	35	23	24	45
B-757	36	35	40	48	51
B-767	25	27	33	52	37
Lockheed-TOTAL	7	1	2	5	—
L-1011	2	—	—	—	—
L-100	5	1	2	5	—
McDonnell Douglas-TOTAL	71	91	98	129	119
MD-80	71	86	95	121	118
DC-10	—	5	3	8	1

Source: Aerospace Industries Association, based on company reports.
a U.S.-manufactured fixed-wing aircraft over 33,000 lbs.
r Revised.

SPECIFICATIONS OF U.S. CIVIL JET TRANSPORT AIRCRAFT[a]

On Order or In Production as of 1989

Number of Engines and Crew, and Model Designation[b]	Initial Service	Standard Mixed Class	Operating Empty Weight (000's lbs)	Maximum Takeoff Gross Weight (000's lbs)	Range (Nautical Miles)[c]	Engine Model and Manufacturer[d]
FOUR ENGINES/CREW OF 3						
747-200B*	1971	366-452	374	833	7,570	P&W JT9D-7R4G2
747SP*	1976	276-343	333	700	7,670	RR RB-211-524D4
747-300B*	1983	400-490	383	833	7,310	P&W JT9D-7R4G2
747-400*	1988	412-509	390	870	8,380	GE CF6-80C2
THREE ENGINES/CREW OF 3						
DC-10-10*	1971	250-380	243	440	4,123	GE CF6-6D
DC-10-15*	1981	250-380	249	455	4,422	GE CF6-50C2-F
DC-10-30*	1972	250-380	267	572	6,357	GE CF6-50C2
DC-10-40*	1972	250-380	271	572	5,988	P&W JT9D-59A
MD-11*	1989	321-405	277	603	8,070	GE CF6-80C2-DF1 or P&W PW4360
MD-11ER*	1989	277	265	603	8,525	GE CF6-80C2-DF1 or P&W PW4360
TWO ENGINES/CREW OF 2						
737-200	1971	120	61-62	116-129	2,140 -2,840	P&W JT8D-15A or P&W JT8D-17A
737-300	1984	141	70-71	125-139	1,840 -2,950	CFMI CFM56-3-B1 or B2
737-400	1988	159	73	139	2,250	CFMI CFM56-3-B2
757-200	1982	186-200	126	198	4,550	RR RB211-535E or P&W PW 2037
767-200*	1982	174-290	176	315	4,566	P&W JT9D-7R4 or GE CF6-80A
767-200ER*	1984	174-290	180	351	5,942	P&W JT9D-7R4 or GE CF6-80A
767-300*	1986	204-290	190	351	4,650	P&W JT9D-7R4 or GE CF6-80A
767-300ER*	1987	204-290	196	400	6,650	P&W PW4000 or GE CF6-80C2
MD-80 series:						
MD-81	1980	155	78	140	1,720	P&W JT8D-209 or P&W JT8D-217A
MD-82	1981	155	79	150	2,350	P&W JT8D-217A
MD-83	1985	155	81	160	2,940	P&W JT8D-219
MD-87	1987	130	73	140	2,740	P&W JT8D-217C
MD-88	1987	155	78	150	2,150	P&W JT8D-217C

Source: Aerospace Industries Association, based on company reports and Aviation Week & Space Technology, "Aerospace Forecast & Inventory" (Annually).

a All jet-powered passenger transport aircraft 33,000 pounds or more empty weight.

b The Boeing Company manufactures models: 727, 737, 747, 757, & 767 and McDonnell Douglas Corporation manufactures models: MD-80, MD-11, and DC-10.

c Full passenger load and baggage.

d P&W = Pratt and Whitney; GE = General Electric; RR = Rolls-Royce; CFMI = General Electric/Snecma.

* Wide-body aircraft.

SPECIFICATIONS OF U.S. CIVIL HELICOPTERS

In Production as of 1989

Company	Commercial Model	Number of Places	Useful Load (Lbs.)	Range with Useful Load (N. Miles)	External Cargo Payload (Lbs.)
Bell Helicopter Textron	212	15	5,228	231	5,000
	214 Series	16	6,145	196	8,000
	222	9	2,961	350	2,500
	412	15	5,430	402	11,900
Enstrom Helicopter	F-28 Series	3	1,030	228	1,000
	280 Series	3	1,105	260	1,000
McDonnell Douglas Helicopter	500 Series	5	1,559	367	2,000
	530 Series	5	1,536	275	2,000
Robinson Helicopter	R22	2	546	209	—
Schweizer Aircraft	300C	3	932	232	1,032
Sikorsky Aircraft	S-76A	14	4,570	473	3,300
	S-70C	19	11,862	297	8,000

Source: Helicopter Association International, "1990 Helicopter Annual" (Annually).

CIVIL HELICOPTER SHIPMENTS[a]

Calendar Years 1985-1989

Company and Model	1985	1986	1987	1988	1989
CIVIL SHIPMENTS	384[r]	326	358	383	515
Value (Millions of Dollars)	$506[r]	$287	$277	$334	$251
Bell-TOTAL	146	125	127	62	22
206 series[b]	87	67	74	—	—
212	8	11	11	13	3
214 series	10	15	13	18	2
222	22	20	12	11	—
412	19	12	17	20	17
Boeing Vertol-TOTAL	4	—	—	—	—
234	4	—	—	—	—
Enstrom-TOTAL	18	10	12	17	24
F-28 series	11	3	7	7	6
280 series	7	7	5	10	18
Hiller-TOTAL	2	—	—	—	—
12-E series	2	—	—	—	—
McDonnell Douglas-TOTAL	56	65	41	44	73
269 series	—	1	—	—	—
500 series	48	40	37	39	64
530 series	8	24	4	5	9
Robinson-TOTAL	79	90	127	204	310
R22	79	90	127	204	310
Schweizer-TOTAL	32[r]	23	37	45	69
300C	32[r]	23	37	45	69
Sikorsky-TOTAL	47	13	14	11	17
S-76	19	10	13	11	17
S-70B-3	2	—	—	—	—
S-70C series	26	3	1	—	—

Source: Aerospace Industries Association, based on company reports.

NOTE: All data exclude production by foreign licensees.

a Domestic and export helicopter shipments for non-military use. Helicopters in military configuration exported to foreign governments and purchased under commercial contract are reported elsewhere. Models which may be shipped in either a civil or a military configuration appear in both tables.

b Bell Helicopter moved production of its 206 series helicopters to its Canadian facility in 1987.

r Revised.

DIRECT EXPORT SHIPMENTS OF MILITARY HELICOPTERS[a]

Calendar Years 1985-1989

Manufacturer and Model	1985	1986	1987	1988	1989
DIRECT MILITARY EXPORT SHIPMENTS	38	11r	21	66	46
Value (Millions of Dollars)	$75	$88r	$57	$352	$278
Bell AH-1S	10	—	—	24	26
Boeing Vertol CH-47/414/352	3	7r	4	1	—
McDonnell Douglas 500MD (TOW)/ 500 Scout	25	—	11	19	—
Schweizer 300C	—	4	6	—	—
Sikorsky S-70C	—	—	—	13	17
Sikorsky S-80M	—	—	—	—	3
Sikorsky MH53	—	—	—	9	—

Source: Aerospace Industries Association, company reports.

a Shipments of helicopters in military configuration exported directly from U.S. manufacturers to foreign governments. Military helicopters exported via Foreign Military Sales (FMS) are reported with Dept. of Defense (DoD) aircraft acceptance data elsewhere in this chapter. Some models reported on this page may be shipped in either military or civil configuration; see Civil Helicopter Shipments table for additional data.

r Revised.

GENERAL AVIATION AIRCRAFT SHIPMENTS

By Selected Manufacturers
Calendar Years 1985-1989

	1985	1986	1987	1988	1989
NUMBER OF AIRCRAFT SHIPPED	2,029	1,495	1,085	1,143	1,535
Single-Engine, Piston	1,370	985	613	628	1,023
Multi-Engine, Piston	193	138	87	67	87
Turboprop	321	250	263	291	268
Turbojet	145	122	122	157	157
VALUE OF SHIPMENTS[a] (Millions of Dollars)	$1,431	$1,262	$1,364	$1,918	$1,804
Single-Engine, Piston	$ 126[r]	$ 80	$ 80	$ 66	$ 104
Multi-Engine, Piston	68[r]	43	18	12	24
Turboprop	524[r]	430	477	596	524
Turbojet	713[r]	709	789	1,242	1,149
Number of Aircraft By Selected Manufacturer					
Beech	$ 288	$ 305	$ 314	$ 372	$ 371
Bellanca	NA	NA	NA	NA	7
Cessna	881	549	187	161	183
Christen	NA	NA	NA	NA	75
Fairchild	35	37	36	29	12
Gates Learjet	33	20	16	23	25
Gulfstream	55	26	30	51	40
Lake	20	26	23	28	23
Maule	88	64	54	55	35
Mooney	90	142	143	142	143
Piper	538	326	282	282	621

Source: General Aviation Manufacturers' Association.
a Manufacturers' net billing price.
NA Not available.
r Revised.

MILITARY AIRCRAFT ACCEPTED BY U.S. MILITARY AGENCIES

Number and Flyaway Value
Calendar Years 1975-1989

Year	TOTAL	Bomber/ Patrol/ Command/ Control	Fighter/ Attack	Trans- port/ Tanker	Trainer	Heli- copter	Other
NUMBER							
1975	1,369	62	624	34	40	601	8
1976	1,143	55	646	67	11	348	16
1977	862	44	488	25	12	273	20
1978	723	30	478	28	—	166	21
1979	734	17	529	16	—	158	14
1980	819	16	551	15	18	189	30
1981	918	19	649	17	60	158	15
1982	758	26	478	14	60	172	8
1983	836	34	421	22	120	233	6
1984	632	34	298	18	30	240	12
1985	777	34	409	25	—	306	3
1986	818	52	424	76	—	266	—
1987	858	74	483	36	—	265	—
1988	842r	55	509r	31	—	247r	—
1989	661	12	405	21	—	223	—
FLYAWAY VALUE—Millions of Dollars							
1975	$ 3,172	$ 599	$2,054	$ 128	$27	$ 359	$ 5
1976	4,729	547	3,421	340	27	384	10
1977	4,364	499	3,190	331	14	316	14
1978	4,664	689	3,496	237	—	225	17
1979	5,470	442	4,660	136	—	219	13
1980	6,514	475	5,282	178	32	516	31
1981	8,446	526	6,518	509	32	825	19
1982	8,605	886	6,383	410	42	872	12
1983	9,640	1,259	6,708	575	79	1,009	10
1984	9,308	1,270	5,774	627	18	1,597	22
1985	14,122	3,640	7,923	838	—	1,715	6
1986	20,903	8,177	8,004	2,665r	—	2,057	—
1987	21,459	8,569	8,900	2,218	—	1,772	—
1988r	16,031	2,911	8,953	2,314	—	1,853	—
1989	9,357	355	6,543	743	—	1,716	—

Source: Aerospace Industries Association, based on USAF, USN, and USA survey responses.
NOTE: Data represent new U.S. manufactured aircraft, excluding gliders and targets. Values include spares, spare parts, and support equipment that are procured with the aircraft. Includes aircraft accepted for shipment to foreign governments for military assistance programs and foreign military sales. Flyaway value for 1975 does not include the value of planes produced for the security assistance programs and accepted by the USAF.
r Revised.

MILITARY AIRCRAFT ACCEPTANCES BY UNITED STATES AIR FORCE[a]

Calendar Years 1988-1989
(Costs in Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]		Weapon System Cost[c]	
	1988	1989	1988	1989	1988	1989
AIR FORCE—TOTAL	278	230	$7,963	$3,947	$9,407	$4,704
Fighter/Attack—TOTAL	211	191	$3,230	$3,107	$4,099	$3,800
F-15	34	33	997	18	1,317	1,325
F-16	177	158	2,233	1,989	2,782	2,475
Bombers—TOTAL	17	—	2,289	—	2,721	—
B-1B	17	—	2,289	—	2,271	—
Transports/Tankers—TOTAL	31	21	2,314r	743	2,335r	746
C-5B	22	5	2,139r	458	2,150r	459
KC-10A	1	—	59	—	59	—
C-130H	8	16	116	285	125	287
Command/Control—TOTAL	3r	—	51r	6	132r	8
TR-1A	3r	—	51r	6	132r	8
Helicopters—TOTAL	16	18	79	91	121	150
MH-60G	16	18	79	91	121	150

Source: Department of the Air Force.
NOTE: Costs shown are approximate. Calendar year acceptances may derive from procurement quantities funded in more than one fiscal year.
a Air Force acceptances for own use; excludes FMS/MAP shipments.
b Flyaway Cost includes airframe, engines, electronics, communications, armament, other installed equipment and non-recurring costs associated with the manufacture of the aircraft.
c Weapon system cost includes flyaway costs, peculiar ground equipment, training equipment, and technical data.
r Revised.

MILITARY AIRCRAFT ACCEPTANCES BY UNITED STATES ARMY[a]

Calendar Years 1988-1989
(Costs in Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]		Weapon System Cost[c]	
	1988	1989	1988r	1989	1988r	1989
ARMY—TOTAL	190	184	$1,391	$1,372	$1,704	$1,691
Helicopters—TOTAL	190	184	$1,391	$1,372	$1,704	$1,691
UH-60A	72	72	375	403	430	461
AH-64	118	112	1,016	969	1,275	1,230

Source: Department of the Army.
a Army acceptances for own use; excludes FMS/MAP shipments.
b Flyaway cost includes airframes, engines, electronics, communications, armament and other installed equipment.
c Weapon System Cost includes flyaway cost, initial spares, ground equipment, training equipment and other support items.
r Revised.

MILITARY AIRCRAFT ACCEPTANCES BY UNITED STATES NAVY[a]

Calendar Years 1988-1989
(Costs in Millions of Dollars)

Type and Model	Number		Flyaway Cost[b]		Weapon System Cost[c]	
	1988[r]	1989	1988[r]	1989	1988[r]	1989
NAVY—TOTAL	236	166	$4,492	$3,661	$5,696	$4,428
Patrol—TOTAL	35	12	$ 571	$ 349	$ 774	$ 454
P-3C	6	—	167	—	211	—
EA-6B	12	12	338	349	400	454
S-3B	17	—	66	—	163	—
Fighter/Attack—TOTAL	160	133	3,538	3,058	4,335	3,662
F-14A	17	17	598	570	724	755
F/A-18	89	76	2,098	1,880	2,468	2,211
AV-8B	46	39	723	589	772	650
A-6E	8	1	119	19	371	46
Helicopters—TOTAL	41	21	383	254	587	312
AH-1W	8	—	5	—	119	—
CH-53E	10	6	126	84	150	108
SH-60B	19	12	220	145	274	169
SH-2F	4	3	32	24	44	35

Source: Department of the Navy.
a Navy acceptances for own use; excludes FMS shipments.
b Flyaway Cost includes airframe, engines, electronics, communications, armament, other installed equipment, non-recurring costs, and ancillary equipment.
c Weapons System Cost (Investment Cost) includes flyaway cost, initial spares, ground equipment, training equipment, and other support items.
r Revised.

MILITARY AIRCRAFT ACCEPTANCES FOR REIMBURSABLE PROGRAMS[a]

Calendar Years 1988-1989
(Costs in Millions of Dollars)

Accepting Agency, Type, and Model	Number of Aircraft Accepted		Flyaway Cost[b]	
	1988	1989	1988	1989
TOTAL ACCEPTANCES FOR REIMBURSABLE PROGRAMS	138	81	$2,185	$1,478
AIR FORCE—TOTAL	98	57	$1,263	$ 969
Fighter/Attack—TOTAL	98	57	1,263	969
F-16 C/D	98	57	1,263	969
NAVY—TOTAL	40	24	$ 922	$ 509
Fighter/Attack—TOTAL	40	24	922	509
F/A-18	40	24	922	509
ARMY—TOTAL	—	—	—	—

Source: Aerospace Industries Association, based on USAF, USN, and USA survey responses.

a Foreign government aircraft purchases through the Department of Defense Foreign Military Sales program.

b Flyaway cost includes airframes, engines, electronics, communications, armament, other installed equipment, and nonrecurring costs associated with the manufacture of the aircraft.

MILITARY AIRCRAFT PROGRAM PROCUREMENT[a]

Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Agency, Type, and Model	1989		1990[E]		1991[E]	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
AC-130U	6	$ 315.4	5	$ 235.1	—	$ —
B-2	3	2,796.4	2	2,070.2	5	3,206.0
C-17	4	995.6	4	1,207.5	6	1,908.8
C-20[c]	—	—	3	74.0	1	25.0
C-26	—	—	9	36.0	—	—
C-27A	—	—	5	73.3	5	79.5
C-130H Hercules	—	406.9	14	308.2	5	120.0
Civil Air Patrol (CAP) Aircraft	38	1.8	38	2.5	38	1.9
F-15E Eagle	36	1,377.8	36	1,337.1	36	1,699.8
F-16 Falcon	180	2,877.7	150	2,984.2	150	2,794.5
HC-130	—	—	1	42.6	—	—
KC-135 Re-engining/Modern	47	743.6	36	572.4	24	446.6
LANTIRN (Night Precision Attack)	—	689.1	—	241.1	—	186.8
MC-130H Combat Talon	4	330.8	2	169.0	—	85.8
MH-60G	9	75.4	4	48.6	4	36.9
T-1A (TTTS)	1	9.5	14	144.4	28	185.2
ARMY						
AH-64 Attack Helicopter	72	$ 926.3	132	$1,469.5	—	$ 104.2
C-212 Grisly Hunter	—	—	1	9.8	1	10.4
C-23 Sherpa	—	—	6	42.0	—	—
CH-47 Modernization	—	247.4	—	273.7	—	294.2
OH-58D AHIP Modification	36	202.9	36	192.3	—	48.0
RC-12D Guard Rail	6	62.0	5	52.0	5	87.4
UH-60A Black Hawk[b]	72	421.2	72	381.6	72	469.3
NAVY						
AH-1W Sea Cobra	—	$ 53.8	6	$ 58.6	—	$ —
AV-8B Harrier	24	511.9	24	449.1	24	457.3
CH/MH-53E Super Stallion	14	227.4	10	205.6	23	434.8
E-2C Hawkeye	6	345.3	4	291.1	6	389.0

(Continued on next page)

MILITARY AIRCRAFT PROGRAM PROCUREMENT[a] (Continued)

Agency, Type, and Model	1989		1990[E]		1991[E]	
	No.	Cost	No.	Cost	No.	Cost
NAVY (Continued)						
E-6A Hermes	7	$ 332.2	—	$ —	—	$ —
EA-6B Prowler	12	544.8	—	129.6	3	350.0
F-14D Tomcat	12	902.9	24	1,408.7	12	906.2
F/A-18 Hornet	84	2,444.3	66	1,916.8	66	2,045.0
HH-60H[b]	—	15.4	—	—	—	—
KC-130T	2	45.0	2	50.0	1	25.0
P-7A LRAACA	—	—	—	—	—	20.5
SH-60B Seahawk LAMPS MK-111	6	109.3	6	187.0	6	144.4
SH-60F CV ASW	18	349.5	—	79.1	18	272.1
T-44A Trainer	—	—	5	12.0	—	—
T-45 Training System	24	414.0	—	96.3	12	305.9
V-22[c]	—	333.9	—	—	—	—

Source: Department of Defense Budget, "Program Acquisition Costs by Weapon System" (Annually).
NOTE See Research and Development Chapter for aircraft program RDT&E authorization data.
a Total Obligational Authority for procurement, excluding initial spares.
b Army, Navy, and Air Force funding.
c Navy and Air Force funding.
E Estimate. Latest year reflects Administration's budget proposal.

ACTIVE U.S. MILITARY AIRCRAFT IN CONTINENTAL U.S.[a]

Fiscal Years 1979-1991

Year	Total	Fixed Wing Aircraft				Helicopter
		Total	Jet	Turboprop	Piston	
1979	18,526	11,365	8,656	1,859	850	7,161
1980	18,969	11,362	8,794	1,869	699	7,607
1981	19,363	11,645	9,111	1,943	591	7,718
1982	21,728	12,063	9,647	1,900	516	9,665
1983	18,652	11,603	9,495	1,745	363	7,049
1984	18,833	11,661	9,551	1,777	333	7,172
1985	19,333	11,929	9,640	1,881	408	7,404
1986	20,157	11,919	9,730	1,803	386	8,238
1987	20,514	12,054	9,819	1,865	370	8,460
1988	21,210	12,481	9,954	2,222	305	8,529
1989[E]	19,741	11,938	9,576	2,098	264	7,803
1990[E]	19,110	11,693	9,461	1,968	264	7,417
1991[E]	18,996	11,838	9,648	1,927	263	7,158

Source: Office of the Secretary of Defense, as reported in "FAA Aviation Forecasts" (Annually).
a Includes Army, Air Force, Navy, and Marine regular service aircraft, as well as Reserve and National Guard Aircraft.
E Estimate.

DEPARTMENT OF DEFENSE
OUTLAYS FOR AIRCRAFT PROCUREMENT

By Agency
Fiscal Years 1962-1991
(Millions of Dollars)

Year	TOTAL AIRCRAFT PROCUREMENT	Air Force	Navy	Army
1962	$ 6,659	$ 4,387	$ 2,102	$ 170
1963	6,309	3,747	2,328	234
1964	6,053	3,894	1,859	300
1965	5,200	3,115	1,739	346
1966	6,635	4,074	2,021	540
1967	8,411	4,842	2,607	962
1968	9,462	5,079	3,244	1,139
1969	9,177	5,230	2,821	1,126
1970	7,948	4,623	2,488	837
1971	6,631	3,960	2,125	546
1972	5,927	3,191	2,347	389
1973	5,066	2,396	2,557	113
1974	5,006	2,078	2,806	122
1975	5,484	2,211	3,137	136
1976	6,520	3,323	3,061	136
Tr.Qtr.	1,557	859	672	26
1977	6,608	3,586	2,721	301
1978	6,971	3,989	2,602	380
1979	8,836	5,138	3,140	558
1980	11,124	6,647	3,689	787
1981	13,193	7,941	4,397	855
1982	16,793	9,624	5,872	1,297
1983	21,013	11,799	7,490	1,724
1984	23,196	12,992	8,040	2,165
1985	26,586	15,619	8,263	2,705
1986	30,828	18,919	8,922	2,987
1987	32,956	20,036	9,614	3,306
1988	28,246	15,961	9,407	2,878
1989	27,569	14,662	10,073	2,834
1990[E]	27,246	15,033	9,330	2,883
1991[E]	26,677	14,521	9,194	2,963

Source: Department of Defense Budget (Annually).
NOTE: Detail may not add to totals because of rounding.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

SPECIFICATIONS OF U.S. MILITARY AIRCRAFT ON ORDER OR IN PRODUCTION AS OF 1989

Primary Mission, DOD Designation, & Popular Name	Manufacturer	U.S. Military Service	Crew	Empty Weight (000's lbs)	Engines	Performance Typical for Primary Mission	Remarks
ATTACK							
A-6E Intruder	Grumman	USN/USMC	2	27	2xP&W J52	Mach 0.8 at sea level	Also EA-6A/B & KA-6D
AC-130U Gunship	Rockwell	USAF	13	125	4xAll T56	325 kt; 2,700 n.m.	Special Operations gunship
AV-8B Harrier 2	MDC/BAe	USMC	1	13	1xRR F402	Mach 0.91	Graphite/epoxy super-critical wing
BOMBERS							
B-2 Stealth Bomber	Northrop	USAF	2-3	—	4xGE F118	--	Radar eluding tactical bomber
ELECTRONIC WARFARE							
EA-6B Prowler	Grumman	USN/USMC	4	33	2xP&W J52	493 n.m. standoff radius	Tactical jamming system
FIGHTERS							
F-14A Tomcat	Grumman	USN	2	40	2xP&W TF30	Mach 2.3 class	Missile, gun fleet defense
F-14A+ Super Tomcat	Grumman	USN	2	42	2xGE F110	Mach 2.3 class	F-14A with upgraded engines and radar
F14D	Grumman	USN	2	42	2xGE F110	Mach 2.3 class	F14A+ with improved avionics and infrared track and search system
F-15C/D Eagle	MDC	USAF	1-2	31	2xP&W F100	Mach 2.5 class	Air superiority, defense, guns, missiles; 15D = 2 seat trainer
F-15E Eagle	MDC	USAF	2	32	2xP&W F100	Mach 2.5 class	Dual role fighter/long range interdiction
F-16 A/B Fighting Falcon	GD	USAF	1-2	15	1xP&W F100	Mach 2+ class	Multirole fighter; fully fly-by-wire; missiles, guns.
F-16 C/D Fighting Falcon	GD	USAF	1-2	16	1xP&W F100/ 1xGE F110	Mach 2+ class	Provisions for AMRAAM, LANTIRN and new EW Nav. Comm. Systems.
F/A-18 Hornet	MDC/Northrop	USN/USMC	1	23	2xGE F404	Mach 1.7+ class	Missiles, guns; also export
COMMAND/CONTROL AND PATROL							
RC-12D/G/H/K	Beech	Army	2	9	2xPWC PT6-41	Max 294 kias	Modified Super King Air 200
TR-1/U-2	Lockheed	USAF	1	18	1xP&W J75	Altitudes 70,000 ft+	High alt. tactical recon.
S-3B Viking	Lockheed	USN	4	29	2xGE TF34	Max 450 kt	Antisubmarine warfare
P-3C Orion	Lockheed	USN	12	67	4xAll T56	14+ hr. mission duration	Torpedoes, missiles, sonobouys, mines; also export
E-2C Hawkeye	Grumman	USN	5	38	2xAll T56	6 hr. mission duration	AEW command & control; passive detection
CARGO-TRANSPORT							
C/HC-130 Hercules	Lockheed	USAF/USN	4	74-78	4xAll T56	363 mph; 2,038 n.m.	92-128 troops or 39-43,000 lbs.
C-5B Galaxy	Lockheed	USAF	6	363	4xGE TF39	Cruise 563 mph; 3,000 n.m. range	Global strategic logistics; 261,000 lb. cargo capacity
C-17A	MDC	USAF	3	270	4xP&W F117	Mach 0.77; 3,000 n.m.	102 troops or 172,000 lbs.
C-12 Huron	Beech	Army/USAF	2	8	2xPWC PT6A	Cruise 290 kt; 1,900 n.m.	10-place; pass. or cargo
C-20A G3	Gulfstream	USAF	2	32	2xRR Spey	Mach 0.77; 3,650 n.m.	VIP transport; 14 pass.
C-26	Fairchild	ANG	2	10	2xGA TPE-331	275 mph; 700 n.m.	8-place; pass. or cargo
TRAINING							
T-45A Goshawk	MDC/BAe	USN	2	9	1xRR F405	Mach 0.85 at 35,000 ft.	Next generation trainer
T-1A	Beech	USAF	2	11	2xP&W AJT-15D	460 kt at 35 k ft.	Tanker/Transport Trainer
HELICOPTERS							
AH-1W Super Cobra	Bell-Textron	USN	2	10	2xGE T700	Max 218 mph; 395 mi.	TOW, hellfire, sidewinder
AH-64 Apache	MDC	Army	2	12	2xGE T700	Max 197 mph; 445 mi.	Attack helicopter
CH-47 Chinook	Boeing Vertol	Army	3	23-26	2xLyc T55	Max 183 mph; 263 mi.	—
CH/MH-53E	Sikorsky	USN	3-5	33-36	3xGE T64	Max 196 mph; 710 mi.	55 passengers, aux. tanks/ minesweeping
OH-58D Aeroscout	Bell-Textron	Army	2	3	1xAll 250	Max 137 mph; 325 mi.	—
SH-2F Seasprite	Kaman	USN	3	7	2xGE T58	Max 160 mph; 430 mi.	LAMPS Mk.I helicopter
SH-60B Seahawk	Sikorsky	USN	3	15	2xGE T700	Max 171 mph; 640 mi.	ASW
UH-60A Black Hawk	Sikorsky	Army/USAF	3	11	2xGE T700	Max 184 mph; 373 mi.	UTTAS

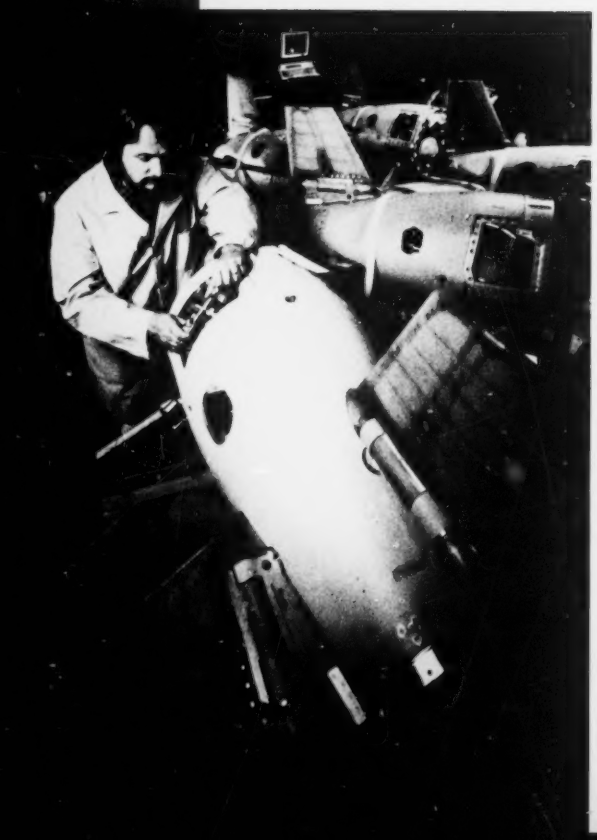
Source: Aviation Week & Space Technology, "Aerospace Forecast & Inventory" (Annually).
KEY: All = Allison Gas Turbine; BAe = British Aerospace; GA = Garrett Engine; GD = General Dynamics; GE = General Electric; Lyc = Textron Lycoming; MDC = McDonnell Douglas; P&W = Pratt & Whitney; PWC = Pratt & Whitney of Canada; RR = Rolls Royce.

MISSILE PROGRAMS

90-91

Industry sales of missile systems declined slightly in 1989, but the flow of new orders and the industry's backlog increased.

According to Bureau of the Census reports, sales of missile systems and parts amounted to $9.3 billion, down from $9.5 billion in 1988.



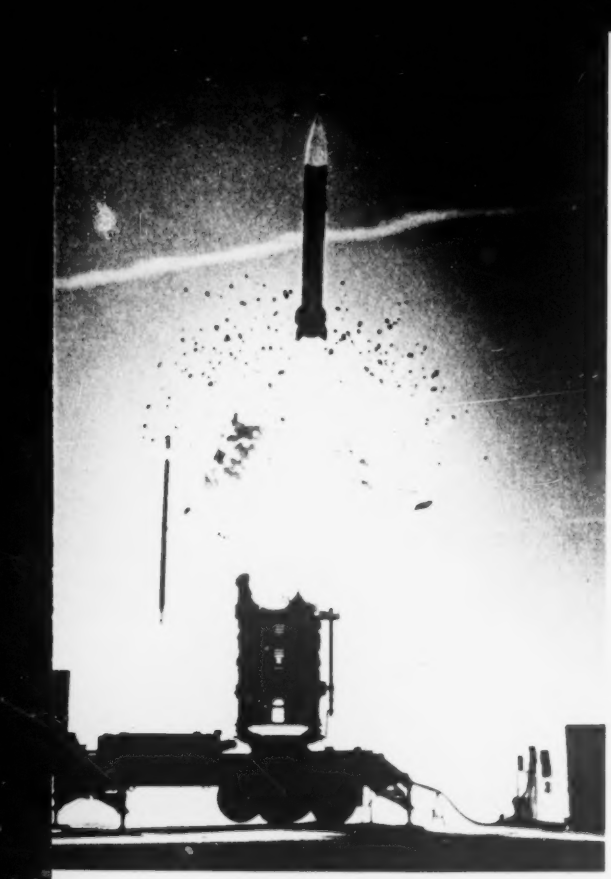
Net new orders for missile systems and parts totaled $10.1 billion, up from $9.4 billion in the previous year. Backlog as of yearend 1989 was $15.1 billion, which compares with $14.3 billion at the end of 1988.

The Bureau of the Census separately reported sales of missile-related propulsion systems as part of a statistical grouping that also includes propulsion units for both military and civil space launch vehicles.

In 1989, total sales in that grouping came to $3.6 billion, up from $3.4 billion. In the military sub-category—which includes both missile and space launch propulsion—sales declined slightly (to $1.8 billion), while sales in the non-military category (civil space launch propulsion) increased sharply to $1.8 billion.

Net new orders for missile/space propulsion systems amounted to $6 billion, a big jump of more than 70 percent over 1988's $3.5 billion. That increase was compounded of gains in both the military and non-military categories. New orders for military systems climbed to $2.3 billion (from 1988's $1.6 billion) and in the non-military category orders increased at a greater rate, to $3.7 billion from 1988's $1.9 billion.

The yearend backlog for missile/space propulsion units was $6.4 billion, a 60 percent gain over the previous year's $4 billion. The gain was largely in the non-military segment, up from



$2 billion in 1988 to $3.8 billion in 1989. The military backlog grew from $2 billion in 1988 to $2.6 billion in 1989.

The Department of Defense budget plan for Fiscal Year 1991 contemplated procurement of missile systems valued at $14.1 billion, a slight increase over the previous year's $13.9 billion. These figures, compared with the FY 1989 peak level of $14.5 billion, offer only an approximate guideline of DoD plans, priorities and program scopes, which will require revision due to Congressional actions not finalized at publication time.

Under the DoD plan, the Air Force would procure missile systems worth $7.1 billion, the Navy $4.4 billion and the Army $2.5 billion; the figure for the Air Force and Navy is close to that of the previous year and down slightly from the 1989 peak. The Army's missile procurement increased 12 percent in value.

For FY 91, the missile program with the highest procurement value (excluding spares and RDT&E) is the USAF's Peacekeeper ICBM; the Air Force planned a buy of 12 additional Peacekeepers at a cost of $1.9 billion. Next in value is a planned Navy procurement of 52 more Trident II Fleet Ballistic Missiles worth $1.5 billion, and an Air Force purchase of 1,800 AMRAAM (Advanced Medium Range Air-to-Air Missile) units at a cost of $1.3 billion.

Other major missiles in production during 1989/90 or planned for initial production under FY 1991 funding include:

Air Force. The Advanced Cruise Missile, $473 million; the HARM antiradiation weapon, being procured by the Air Force for dual-service (USN and USAF) use, $370 million; the Have Nap Israeli-designed standoff air-to-ground missile for standoff launch against hard targets, $26 million; and the SRAM II supersonic air-to-ground missile for standoff launch against hard targets, $21 million.

Navy. The ship-launched Tomahawk cruise missile, $809 million; the standard ship-defense surface-to-air missile, $608 million; the Harpoon air-launched antiship missile, $241 million; the RAM (Rolling Airframe Missile), a system for defense against antiship missiles, $70 million; the Penguin antiship missile, $44 million; and the Maverick air-to-surface weapon, $13 million.

Army. The Patriot long range air defense missile, $883 million; the Multiple Launch Rocket System, a mobile rocket battery, $374 million; the LOS-F-H (Line of Sight, Forward, Heavy) air defense missile, $272 million; the Stinger short range antiaircraft weapon used by all services, 252 million, and in a separate procurement, the Pedestal Mounted Stinger, $123 million; the TOW 2 Army/Marine Corps antitank weapon, $220 million; ATACMS (Army Tactical Missile System), $187 million; and the Laser Hellfire helicopter-launched antiarmor missile, used by the Army and Navy, $165 million.

MISSILE PROGRAM PROCUREMENT[a]

Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Agency, Type, and Model	1989		1990[E]		1991[E]	
	No.	Cost	No.	Cost	No.	Cost
AIR FORCE						
ACM	—	$ —	100	$ 315.4	100	$ 473.3
AMRAAM[b]	900	830.2	900	795.7	1,800	1,315.3
HARM[b]	2,200	512.4	1,488	368.3	1,440	369.7
HAVE NAP	6	8.3	22	23.4	26	25.8
Peacekeeper	12	792.5	12	832.5	12	1,861.0
Sidewinder[b]	760	37.1	—	0.5	—	0.4
SRAM II	—	—	—	10.7	—	21.2
NAVY						
Harpoon	119	$ 172.9	190	$ 212.1	215	$ 241.1
Hawk[e]	467	132.2	—	—	—	—
MAVERICK[b]	3,271	335.7	2,830	235.1	—	13.1
PENGUIN	—	3.5	64	66.3	65	44.2
Phoenix	403	394.4	420	323.3	—	—
RAM	260	51.8	580	90.2	405	70.4
Sparrow[b]	672	111.0	—	—	—	—
Standard	1,310	594.6	940	390.2	900	607.8
Tomahawk	510	675.2	400	572.0	600	808.7
Trident II	66	1,865.6	42	1,439.2	52	1,536.4
VLA	300	104.4	—	—	—	—
ARMY						
AAWS-M	—	$ —	—	$ —	—	$ 15.5
ATACMS	66	70.7	152	93.5	377	187.2
Chaparral	368	56.7	422	25.4	—	—
Laser Hellfire[d]	7,000	239.4	3,402	149.2	4,200	165.4
LOS-F-H	60	109.3	110	198.9	220	271.8
MLRS	48,000	430.7	48,000	496.1	24,000	373.5
Patriot	815	816.7	815	896.6	817	883.2
PMS Stinger	100	92.3	122	114.1	88	123.1
Stinger[f]	9,865	382.4	2,375	114.7	7,203	252.4
TOW 2[c]	12,000	143.1	9,455	105.4	13,284	219.5

Source: Department of Defense, "Program Acquisition Costs by Weapon System" (Annually).
NOTE: See Research and Development Chapter for missile program RDT&E authorization data.
a Total Obligational Authority excluding initial spares and RDT&E.
b Navy and Air Force funding.
c Army and Marine Corps funding.
d Army and Navy funding.
e Marine Corps funding.
E Estimate. Latest year reflects Administration's budget proposal.
f Army, Marine Corps, Navy, and Air Force funding.

MAJOR MISSILES
RESEARCH, DEVELOPMENT, PRODUCTION, OPERATION

Program	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-AIR					
AMRAAM-120A	USAF/USN	D,P	Hughes/Ray	Hercules	Hughes/Ray
Phoenix-54A	USN	O	Hughes	Hercules	Hughes
Phoenix-54C	USN	P	Hughes/Ray	Hercules	Hughes/Ray
Sidewinder-9J	USAF	O	Ford Aero.	Hercules/ Aerojet	Ford Aero.
Sidewinder-9L	USN/USAF	O	NASC	Bermite/ Hercules	Raytheon/ Ford Aero.
Sidewinder-9M	USN/USAF	P	NASC	MTI/Hercules	Ray/Ford Aero.
Sidewinder-9N	USAF	O	Ford Aero.	—	Ford Aero.
Sidewinder-9P	USAF	P,O	Ford Aero.	Hercules/ Aerojet	Ford Aero.
Sidewinder-9R	USN	P	Ford Aero.	MTI/Hercules	Ray/Ford Aero.
Sparrow-7F	USN/USAF	O	NASC	Hercules	Raytheon/GD
Sparrow-7M	USN/USAF	P	Raytheon/GD	Hercules	Raytheon/GD
Sparrow-7P	USN	D	NASC	—	Raytheon
Sparrow-7R	USN	D	NASC	—	Raytheon/GD
AIR-TO-SURFACE					
ALCM	USAF	P	Boeing	WI	Honeywell/ Litton
HARM	USN/USAF	P	TI	MTI	TI
Harpoon*	USN	P,O	MDC	Teledyne CAE	TI/IBM/LSI/ Northrop
GBU-15	USAF	P	RI	Hughes	Hughes/RI
Maverick-65A/B	USAF	P,O	Hughes	MTI/Aerojet	Hughes
Maverick-65D	USAF	P,O	Hughes/Ray	MTI/Aerojet	Hughes/Ray
Maverick-65E	USMC	P	Hughes	MTI/Aerojet	Hughes
Maverick-65F	USN	P	Hughes/Ray	MTI/Aerojet	Hughes/Ray
Maverick-65G	USAF	P	Hughes/Ray	MTI/Aerojet	Hughes/Ray
Shrike-45A/B	USN/USAF	O	NWC/PMTC	Aerojet/ Hercules	Texas Instruments
Sidearm 1-122A	USN/USMC	P	Motorola	Hercules	Motorola
SLAM-84E	USN	P	MDC	Teledyne CAE	MDC/Hughes/ RI
SRAM-69A	USAF	O	Boeing	Lockheed	Singer
Standard ARM-78D	USN/USAF	O	GD	NOSIH	GD
TACIT Rainbow*	USAF	D	Northrop/Ray	WI	TI/Ray
Walleye 1-62	USN	O	MM	—	MM/Hughes
Walleye 1ER-62	USN	R,D	NAC	—	NAC
Walleye 2-62	USN	O	NAC	—	NAC
Walleye 2 (ER/DL)-62	USN	O	NAC	—	NAC

*Also Surface-to-Surface

(Continued on next page)

MAJOR MISSILE PROGRAMS (Continued)

Program	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
AIR-TO-SURFACE (Cont'd.)					
AGM-130A	USAF	D	RI	Hercules	RI
AGM-130B	USAF	D	RI	Hercules	RI
ANTI-SUBMARINE					
Subroc-44A	USN	O	Goodyear Aerospace	MTI	Singer
SURFACE-TO-AIR					
ADATS LOS-F-H	Army/USMC	P	MM	—	GD
Chaparral-72A	Army	O	Ford Aero.	Hercules/ Bermite	GE/Raytheon
Chaparral-72E/H	Army	P,O	Ford Aero.	AR	Ford Aero.
Hawk-23B	Army	P,O	Raytheon	Aerojet	Raytheon
Patriot-104	Army	P	Raytheon	MTI	Raytheon
RAM-116A	USN	D	General Dynamics	Bermite/MTI Hercules	General Dynamics
Redeye-43A	Army/USMC	O	GD	AR	GD
Roland-115	Army	O	Hughes/ Boeing	Hercules	Hughes/ Boeing
Sea Sparrow-7M	USN	P,O	GD/Raytheon	Aerojet/ Hercules	Raytheon/GD
Standard 1 MR	USN	P,O	GD	Aerojet/NOSIH	GD
Standard 2 MR	USN	P,O	GD/Raytheon	AR/MTI	Raytheon/GD
Standard 1 ER	USN	O	GD	AR/NOSIH	GD
Standard 2 ER	USN	P,O	Raytheon/GD	AR/NOSIH/ MTI	Raytheon/GD
Standard 2 Tartar	USN	P,O	GD/Ray	AR/MTI	Ray/GD
Standard 2 Terrier	USN	P,O	GD/Ray	MTI/Ray/ Hercules	Ray/GD
Stinger-92A	Army/USMC	P,O	GD/Raytheon	AR	GD/Raytheon
SURFACE-TO-SURFACE					
Harpoon-84A/C*	USN	P,O	MDC	Teledyne CAE	TI/IBM/LSI/ Northrop
Minuteman 2-30F	USAF	O	AFLC	MTI/Aerojet/ Hercules	Rockwell Autonetics
Minuteman 3-30G	USAF	O	AFLC	MTI/Aerojet	Rockwell Autonetics

*Also Air-to-Surface

(Continued on next page)

MAJOR MISSILE PROGRAMS (Continued)

Program	Agency	Status	Systems Contractor	Propulsion Manufacturer	Guidance Manufacturer
SURFACE-TO-SURFACE (Cont'd.)					
Peacekeeper (MX)-118A	USAF	P,O	BMO	MTI/Avco/ Aerojet/GE/ Hercules/ Rocketdyne	RI/Northrop/ Honeywell/ Litton
Polaris A3-27C	USN	O	Lockheed	Aerojet/ Hercules	GE/Hughes/ MIT/Ray
Poseidon C3-73A	USN	O	Lockheed	MTI/Hercules	GE/MIT/ Ray/Hughes
TACIT Rainbow*	Army	D	Raytheon	Teledyne/Ryan	Ray/E-Systems
Tomahawk (SLCM)	USN	P	GD/MDC	WI	MDC/GD
Gryphon (GLCM)	USAF	P	GD/MDC	WI	MDC/GD
Trident 1 (C4)	USN	P,O	Lockheed	Hercules/MTI	GE/Draper/ Ray/Hughes/ Kearfott
Trident 2 (D-5)	USN	D,P	Lockheed	Hercules/MTI/ UTC	GE/Draper/ Ray/Hughes/ Kearfott
BATTLEFIELD SUPPORT AND ANTIARMOR					
Dragon-47	Army	P,O	MDC	MDC	MDC
Hellfire-114A	Army/USMC	P	RI	Hercules/MTI	MM
Lance-52C	Army	O	LTV	RI/Rocketdyne	E-Systems/ Sys-Donner/ Arma
MLRS-26,-270	Army	P,O	LTV	AR	MM
Pershing 1A	Army	O	MM	MTI	Allied Bendix
Pershing 2	Army	P	MM	Hercules	Goodyear Aerospace
Shillelagh-51C	Army	O	Ford Aero.	Hercules	Ford Aero.
TOW-71A	Army	O	Hughes	Hercules	Emerson El.
ITOW-71C	Army	P,O	Hughes	Hercules	Emerson El.
TOW2-71D	Army	P,O	Hughes	Hercules/MTI	Emerson El./TI
TOW2A-71E	Army	P,O	Hughes	Hercules/MTI	Emerson El./TI

Source: Aerospace Industries Association, based on information from "Aviation Week & Space Technology" Magazine.
Status: R-Research; D-Development; P-Production; O-Operational.

Abb: AFLC-Air Force Logistics Cmd.
AR -Atlantic Research
BMO -Ballistic Missile Office
GD -General Dynamics
GE -General Electric
LSI -Lear Siegler
MM -Martin Marietta
MDC -McDonnell Douglas
MIT -Massachusetts Institute of Technology
MTI -Thiokol
NAC -Naval Avionics Center
NASC -Naval Air Systems Command
NOSIH -Naval Ordnance Station, Indian Head
NWC -Naval Weapons Center
PMTC -Pacific Missile Test Center
Ray -Raytheon
RI -Rockwell International
TI -Texas Instruments
USAF -United States Air Force
USMC -United States Marine Corps
USN -United States Navy
UTC -United Technologies Corp.
WI -Williams International

DEPARTMENT OF DEFENSE
OUTLAYS FOR MISSILE PROCUREMENT[a]

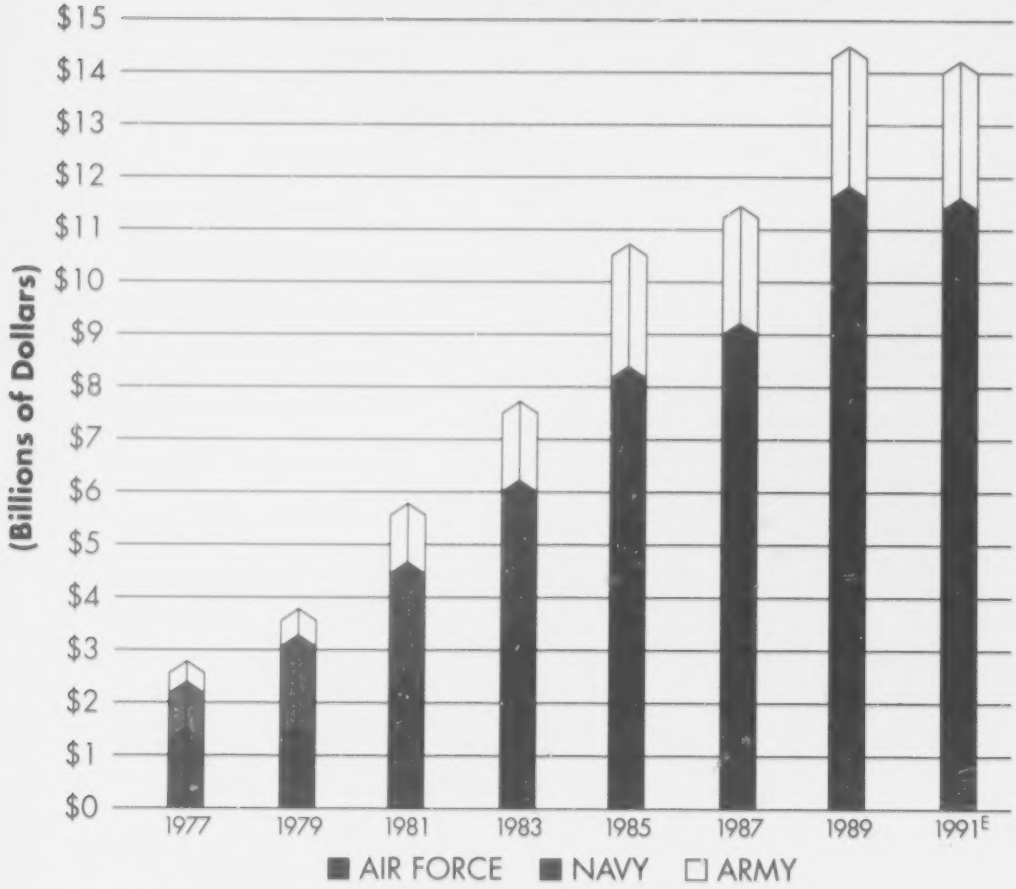
By Agency
Fiscal Years 1962-1991
(Millions of Dollars)

Year	TOTAL MISSILE PROCUREMENT[a]	Air Force	Navy[a]	Army
1962	$ 3,442	$2,385	$ 593	$ 464
1963	3,817	2,676	718	423
1964	3,577	2,100	981	496
1965	2,096	1,320	522	254
1966	2,069	1,313	512	244
1967	1,930	1,278	432	220
1968	2,219	1,388	436	395
1969	2,509	1,382	534	593
1970	2,912	1,467	702	743
1971	3,140	1,497	791	852
1972	3,009	1,334	831	844
1973	3,023	1,454	628	941
1974	2,981	1,537	541	903
1975	2,889	1,602	615	672
1976	2,296	1,549	584	163
Tr.Qtr.	402	347	148	(93)
1977	2,781	1,501	905	374
1978	3,096	1,376	1,302	418
1979	3,786	1,537	1,702	547
1980	4,434	1,810	1,973	651
1981	5,809	2,366	2,297	1,146
1982	6,782	3,069	2,444	1,269
1983	7,795	3,383	2,812	1,600
1984	9,527	4,640	2,809	2,079
1985	10,749	5,409	2,941	2,399
1986	11,731	6,473	2,780	2,478
1987	11,473	6,002	3,157	2,314
1988	11,676	6,046	3,392	2,239
1989	14,503	7,349	4,445	2,709
1990[E]	13,864	7,212	4,378	2,274
1991[E]	14,089	7,118	4,430	2,541

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Revised by AIA from previously published data to include Navy Weapons Procurement in Total Missile Procurement. Beginning 1978, DOD combined Navy Missile Procurement with torpedoes and other related products into Navy Weapons Procurement. Missiles comprise approximately 80 percent of the value of this category.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

DEPARTMENT OF DEFENSE OUTLAYS FOR MISSILE PROCUREMENT BY AGENCY

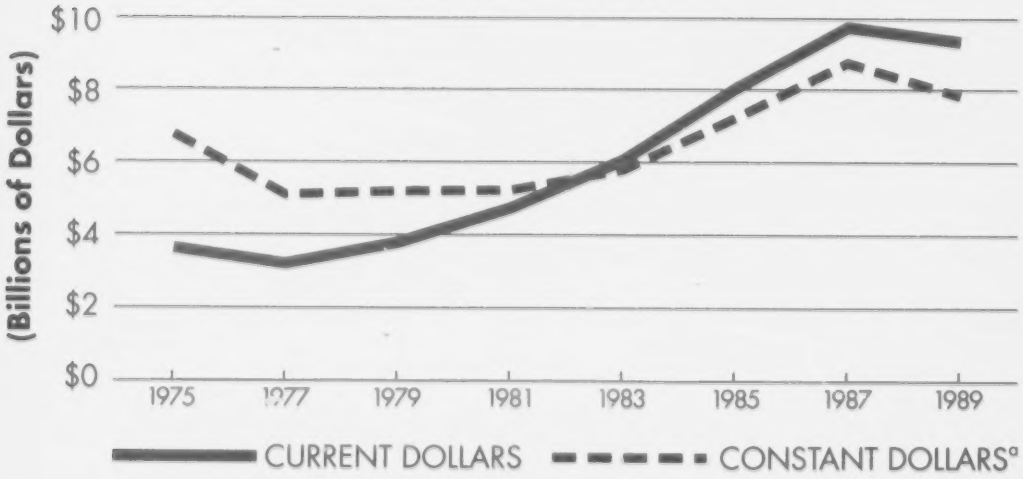
Fiscal Years 1977–1991



Source: Aerospace Industries Association based on Department of Defense Budget.
[E]Estimate. Latest year reflects Administration's budget proposal.

SALES OF MISSILE SYSTEMS & PARTS

Calendar Years 1975–1989



Source: Aerospace Industries Association based on Bureau of Census data.
[a]Based on revised aerospace composite deflator (1982=100).

ORDERS, SALES, AND BACKLOG
MISSILE SYSTEMS AND PARTS[a]

Calendar Years 1974-1989
(Millions of Dollars)

Year	SALES-Current Dollars	SALES-Constant Dollars[c]
1974	$ 3,454	$ 7,318
1975	3,548	6,694
1976	3,237	5,581
1977	3,118	5,021
1978	3,264[b]	4,991
1979	3,706	5,126
1980	3,971	4,945
1981	4,662	5,157
1982	5,676	5,676
1983	5,991	5,711
1984	6,094	5,364
1985	7,975	7,152[c]
1986	8,236	7,354[c]
1987	9,671[r]	8,674[r]
1988	9,485	8,364[c]
1989	9,283	7,768

Year	NET NEW ORDERS	BACKLOG AS OF DECEMBER 31
1974	$ 4,059	$ 4,473
1975	3,655	4,580
1976	3,036	4,379
1977	3,280	4,541
1978	2,948	4,581
1979	3,724	4,916
1980	4,961	5,558
1981	6,030	6,749
1982	6,034	7,107
1983	7,231	8,406
1984	7,731	10,043
1985	8,122	10,190
1986	11,023	12,754
1987	11,482[r]	14,302[r]
1988	9,437	14,255
1989	10,107	15,079

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)," Series MA37D (Annually).
a Prior to 1980, includes space vehicle systems and parts sold to other than U.S. Government customers.
b AIA estimate based on MQ37D.
c Based on revised aerospace composite price deflator (1982 = 100).
r Revised.

ORDERS, SALES, AND BACKLOG ENGINES AND PROPULSION UNITS FOR MISSILES AND SPACE VEHICLES[a]

Calendar Years 1975-1989
(Millions of Dollars)

Year	SALES-Current Dollars			SALES-Constant Dollars[c]		
	TOTAL	Military[b]	Non-Military	TOTAL	Military[b]	Non-Military
1975	$ 643	$ 626	$ 17	$1,213	$1,181	$ 32
1976	641	621	20	1,105	1,071	34
1977	787	757	30	1,267	1,219	48
1978	792	760	32	1,211	1,162	49
1979	952	915	37	1,317	1,266	51
1980	939	661	278	1,169	823	346
1981	1,204	786	418	1,332	869	462
1982	1,555	899	656	1,555	899	656
1983	1,814	951	863	1,729	907	823
1984	2,305	1,116	1,189	2,029	982	1,047
1985	2,466	1,256	1,210	2,212[c]	1,126[c]	1,085[c]
1986	2,995	1,796[r]	1,199[r]	2,674[c]	1,604[r]	1,071[r]
1987	2,993	1,563	1,430	2,684[c]	1,402[c]	1,283[c]
1988	3,407	1,830	1,577	3,004	1,614	1,391
1989	3,582	1,751	1,831	2,997	1,465	1,532

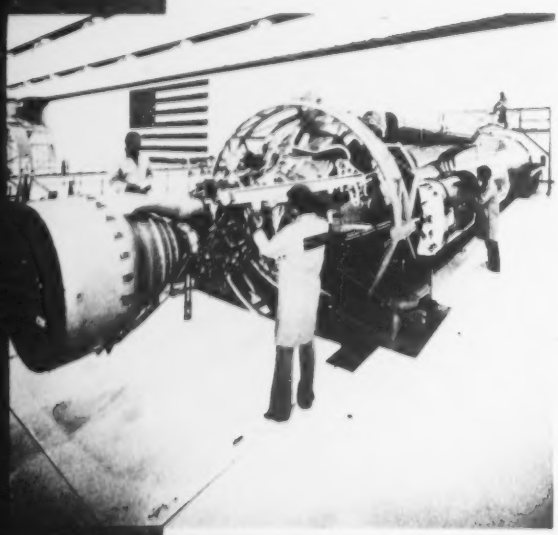
Year	NET NEW ORDERS			BACKLOG AS OF DECEMBER 31		
	TOTAL	Military[b]	Non-Military	TOTAL	Military[b]	Non-Military
1975	$ 496	$ 481	$ 15	$ 531	$ 517	$ 14
1976	783	763	20	673	659	14
1977	727	693	34	613	595	18
1978	967	919	48	788	754	34
1979	1,187	1,141	46	1,024	980	44
1980	1,221[r]	653	568	1,284	871	413
1981	1,284	746	538	1,343	828	515
1982	2,112	1,134	978	1,901	1,063	838
1983	1,618	942	676	1,691	1,052	639
1984	3,770	2,258	1,512	3,156	2,194	962
1985	3,823	1,323	2,500	4,513	2,261	2,252
1986	1,985	1,224	761	3,503	1,689	1,814
1987	3,335	1,995	1,340	3,849	2,121	1,728
1988	3,507	1,623	1,884	3,985	1,998	1,987
1989	6,004	2,340	3,664	6,408	2,588	3,820

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)," Series MA37D (Annually).
a See table in Space Programs Chapter for Orders, Sales, and Backlog, Space Vehicle Systems.
b Prior to 1980 includes figures for nonmilitary U.S. Government customers.
c Based on revised aerospace composite price deflator (1982 = 100).
r Revised.

90-91

Industry sales of space systems in 1989 continued on the upward trend in evidence since the late-1970s and reached an all-time high in current dollar terms.

Sales of civil and military space systems and related equipment amounted to $25.8 billion, according to data compiled by Aerospace Industries Association. The figure represents a gain over 1988's $24.3 billion of about six percent, a lower rate of increase than in the preceding years of the latter 1980s (eight percent in 1986, 11 percent in 1987 and nine percent in 1988). Once again, space sales placed second (behind military aircraft) among industry product groupings. They represent more than 22 percent of the industry's total sales, up from 21 percent in 1988.



Bureau of the Census data also showed a peak level in space sales, but Census employs a different reporting method that includes data on civil and military sales of space systems and launch vehicle components but excludes propulsion units. Because propulsion systems represent a major element of space vehicle cost, Census data serve as general trend indicators rather than as industry activity signposts.

Census reported 1989 space sales of $9.8 billion, a gain of about 13 percent over the 1988 figure of $8.6 billion.

Census reported a big rebound in net new orders for space vehicle systems after a sharp decline in the previous year. Orders received dur-

ing 1989 amounted to $11.5 billion, up from $7.3 billion in 1988 and roughly equal to the 1987 sales level.

The 1989 increase was compounded of gains in both civil and military orders. Military orders amounted to $7.7 billion, up from $4.6 billion in the previous year; non-military orders increased from $2.7 billion in 1988 to $3.8 billion in 1989.

The yearend 1989 space systems backlog, as reported by the Bureau of the Census, was $12.6 billion, which compares with $10.8 billion at the end of the previous year. The 1989 backlog included $9.1 billion in military orders (up from $7.9 billion) and $3.5 billion in non-military orders (up from $3 billion).

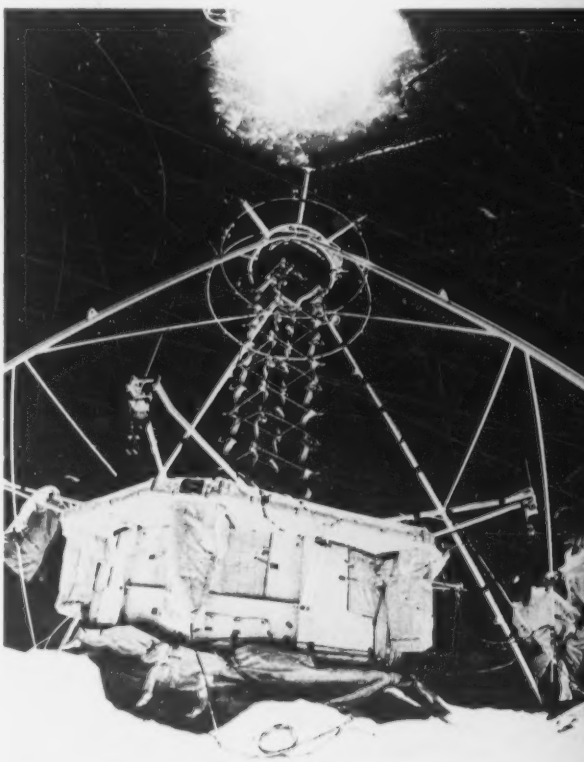
In 1989, NASA flew five Space Shuttle missions, including successful delivery in March of the third operational Tracking and Data Relay Satellite; deployment in May of the Magellan radar-mapping spacecraft toward Venus; and October deployment of the Galileo long-duration Jupiter Explorer. NASA also flew two Shuttle missions, in August and November, carrying classified Department of Defense payloads.

In unmanned civil space activity, highlights included the August 24 encounter of the Voyager 2 spacecraft with the planet Neptune and, on November 18, the launch of the Cosmic Background Explorer (COBE) spacecraft designed to seek evidence supporting the Big Bang theory of the origin of the universe.

In military space activity, the U.S. Air Force began orbital emplacement of the Block II Navstar Global Positioning Systems satellites. The program called for replacing the interim system of seven Block 1 Navstars with a 21-satellite operational network of Block IIs.

In May, the USAF launched two additional spacecraft of the DSCS-3 (Defense Satellite Communication System) series, bringing to five the number in operational service. In September, the Navy launched the eighth and last of the Fleet Satellite Communications System (FLTSATCOM) satellites. The Strategic Defense Initiative Organization conducted—on May 24—the third of a series of space flights intended to check out new sensors and techniques for target acquisition.

In commercial space activity, the highlight of 1989 was the first flight—on August 27—of a U.S.-built commercial launch vehicle, the McDonnell Douglas Delta. The initial unit of another U.S. commercial launch vehicle—the Martin Marietta Commercial Titan III—was successfully launched on December 31. In final assembly status at yearend, slated for flight in 1990, were General Dynamic's Atlas commercial launch vehicle and the commercially-developed air-launched Pegasus booster, a joint venture of Orbital Sciences Corporation and Hercules Aerospace Company.



U.S. SPACECRAFT RECORD[a]

Calendar Years 1957-1989

Year	Earth Orbit[b]		Earth Escape[b]		Year	Earth Orbit[b]		Earth Escape[b]	
	Success	Failure	Success	Failure		Success	Failure	Success	Failure
1957	—	1	—	—	1974	27	2	1	—
1958	5	8	—	4	1975	30	4	4	—
1959	9	9	1	2	1976	33	—	1	—
1960	16	12	1	2	1977	27	2	2	—
1961	35	12	—	2	1978	34	2	7	—
1962	55	12	4	1	1979	18	—	—	—
1963	62	11	—	—	1980	16	4	—	—
1964	69	8	4	—	1981	20	1	—	—
1965	93	7	4	1	1982	21	—	—	—
1966	94	12	7	1[c]	1983	31	—	—	—
1967	78	4	10	—	1984	35	3	—	—
1968	61	15	3	—	1985	37	1	—	—
1969	58	1	8	1	1986	11	4	—	—
1970	36	1	3	—	1987	9[r]	1	—	—
1971	45	2	8	1	1988[r]	16	1	—	—
					1989	17	—	2	—
1972	33	2	8	—					
1973	23	2	3	—	TOTAL	1,154	144	81	15

Source: NASA, "Aeronautics and Space Report of the President" (Annually) and TRW Space & Defense Sector, "Space Log" (Annually).

a Payloads, rather than launchings; some launches account for multiple spacecraft. Includes spacecraft from cooperating countries launched on U.S. launch vehicles.

b The criterion of success is attainment of Earth orbit or Earth escape rather than judgment of mission success. "Escape" flights include all that were intended to go at least an altitude equal to the lunar distance from the Earth.

c This Earth-escape failure did attain Earth orbit and therefore is included in the Earth-orbit success totals.

r Revised.

WORLDWIDE SPACE LAUNCHINGS[a] WHICH ATTAINED EARTH ORBIT OR BEYOND

Calendar Years 1957-1989

Country	Total 1957-1989	1985	1986	1987	1988	1989
TOTAL	3,193	121	103	110	116[r]	101
U.S.S.R.	2,181	98	91	95	90	74
United States	897	17	6	8	12[r]	18
Japan	38	2	2	3	2	2
People's Republic of China	23	1	2	2	4	—
European Space Agency	30	3	2	2	7	7
Israel	1	—	—	—	1	—
Other[b]	23	—	—	—	—	—

Source: NASA, "Aeronautics and Space Report of the President" (Annually) and TRW Space & Defense Sector, "Space Log" (Annually).

a Number of launchings rather than spacecraft; some launches orbited multiple spacecraft.

b Includes 10 by France, 8 by Italy (5 were U.S. spacecraft), 3 by India, 1 by Australia, and 1 by the United Kingdom.

r Revised.

U.S. SPACE LAUNCH VEHICLES

As of 1989

Vehicle and Initial Launch & First Launch of this Modification	Stages	Thrust (Kilo-newtons)	Maximum Payload (Kg)[a]		
			185-Km Orbit	Geo-synch.-Transfer Orbit	Circular Sun-Synch. Orbit
Scout (1960; 1979)	1. Algol IIIA* 2. Castor IIA* 3. Antares IIIA* 4. Altair IIIA*	431.1 285.2 83.1 25.6	255 205[b]	—	155[b]
Delta 2900 Series (Thor-Delta) (1960; 1973)	1. Thor plus 9 TX 354-5* 2. Delta 3. TE 364-4*	912.0 147.0[c] 44.2 65.8	2,000 1,410[b]	705	1,250[b]
Delta 3900 Series (Thor-Delta)[d] (1960; 1982)	1. Thor plus 9 TX 526-2* 2. Delta	912.0 375.0[c] 44.2	3,045 2,180[b]	1,275	2,135[b]
Atlas E (1967; 1972)	1. Atlas booster & sustainer	1,722.0	2,090[b,e]	—	1,500[b]
Atlas-Centaur (1972[f]; 1984)	1. Atlas booster & sustainer 2. Centaur	1,913.0 146.0	6,100	2,360[b]	—

Vehicle and Launch Date	Stages	Thrust (Kilo-newtons)	Maximum Payload (Kg)[a]		
			185-Km Orbit	Direct Geo-synch Orbit	Sun-Synch. Transfer Orbit
Titan IIIB-Agena (1966)	1. LR-87 2. LR-91 3. Agena	2,341.0 455.1 71.2	3,600[b]	—	3,060[b]

(Continued on next page)

U.S. SPACE LAUNCH VEHICLES

As of 1989 (Continued)

Vehicle and Launch Date	Stages	Thrust (Kilo-newtons)	Maximum Payload (Kg)[a] 185-Km Orbit	Direct Geo.-Synch. Orbit	Sun-Synch. Transfer Orbit
Titan III(34)D/ IUS (1982)	1. Two 5½-segment 3.05-m. dia*	11,564.8	14,920	1,850[b]	—
	2. LR-87	2,366.3			
	3. LR-91	449.3			
	4. IUS 1st stage*	275.8			
	5. IUS 2nd stage*	115.7			
Titan III(34)D/ Transtage (1984)	1. Two 5½-segment 3.05-m. dia*	11,564.8	14,920	1,855[b]	—
	2. LR-87	2,366.3			
	3. LR-91	449.3			
	4. Transtage	69.8			
Space Shuttle (reusable) (1981)	1. Orbiter; 3 main engines (SSMEs) fire in parallel with SRBs	1,670[c]	29,500[f]		
	2. Two solid-fueled rocket boosters (SRBs) mounted on external tank (ET) fire in parallel with SSMEs	11,790[c]			

Source: NASA, "Aeronautics and Space Report of the President" (Annually) and NASA Historian's office.

* Solid propellant; all others are liquid.

a Due East launch except as indicated.

b Polar launch.

c Each.

d Maximum performance based on 3920 and 3920/PAM (payload assist module) configurations.

e With dual TE 364-4.

f In full performance configuration (280-420 km orbit).

ORDERS, SALES, AND BACKLOG
SPACE VEHICLE SYSTEMS

(Excluding Engines and Propulsion Units)[a]
Calendar Years 1975-1989
(Millions of Dollars)

Year	SALES-Current Dollars			SALES-Constant Dollars[c]		
	TOTAL	Military[b]	Non-Military	TOTAL	Military[b]	Non-Military
1975	$ 2,119	$1,096	$1,023	$ 3,998	$2,068	$1,930
1976	2,002	904	1,098	3,452	1,559	1,893
1977	1,870	814	1,056	3,011	1,311	1,700
1978	2,324	1,006	1,318	3,554	1,538	2,015
1979	2,539	1,105	1,434	3,512	1,528	1,983
1980	3,483	1,461	2,022	4,337	1,819	2,518
1981	3,856	1,736	2,120	4,265	1,920	2,345
1982	4,749	2,606	2,143	4,749	2,606	2,143
1983	4,940	2,420	2,520	4,709	2,307	2,402
1984	5,225	3,019	2,206	4,599	2,658	1,942
1985	6,300	4,241	2,059	5,610	3,804	1,847
1986	6,304	4,579	1,725	5,629	4,088	1,540
1987[r]	8,051	5,248	2,803	7,221	4,707	2,514
1988	8,622	6,190	2,432	7,603	5,459	2,145
1989	9,770	6,489	3,281	8,176	5,430	2,746

Year	NET NEW ORDERS			BACKLOG AS OF DECEMBER 31		
	TOTAL	Military[b]	Non-Military	TOTAL	Military[b]	Non-Military
1975	$ 1,931	$ 984	$ 947	$ 1,304	$1,019	$ 285
1976	1,932	787	1,145	1,234	902	332
1977	2,225	1,175	1,050	1,589	1,263	326
1978	3,157	1,436	1,721[d]	2,188	1,693	495
1979	2,698	1,018	1,680	1,448	909	539
1980	3,636	1,625	2,011	2,099	1,218	881
1981	5,062	2,878	2,184	3,163	2,166	997
1982	5,842	2,718	3,124	4,254	2,277	1,977
1983	5,399	3,016	2,383	4,865	2,733	2,132
1984	4,984	3,385	1,599	4,624	3,099	1,525
1985	8,383	6,083	2,300	6,707	4,941	1,766
1986	7,437	5,666	1,771	8,063	6,028	2,035
1987[r]	11,455	9,000	2,455	12,393	9,460	2,933
1988	7,296	4,561	2,735	10,838	7,880	2,958
1989	11,540	7,727	3,813	12,617	9,118	3,499

Source: Bureau of the Census, "Aerospace Industry (Orders, Sales, and Backlog)" Series MA37D (Annually).

a See table in Missile Program Chapter for Orders, Sales, and Backlog, Engine and Propulsion Units for Missiles and Space Vehicles.

b Space vehicle systems and parts sold to other than U.S. Government customers included as of 1980; previously, this product group combined with missile systems and parts.

c Based on revised aerospace composite price deflator.

d AIA estimate based on MQ37D data.

r Revised.

FEDERAL SPACE ACTIVITIES OUTLAYS

Fiscal Years 1961-1990
(Millions of Current Dollars)

Year	TOTAL	NASA[a]	DOD	Energy	Commerce	Other[b]
1961	$ 1,467.9	$ 693.6	$ 710.0	$ 64.3	$ —	$ —
1962	2,386.6	1,225.9	1,028.8	130.0	1.0	0.9
1963	4,078.6	2,516.8	1,367.5	181.0	12.2	1.1
1964	5,929.8	4,131.3	1,563.5	220.1	12.3	2.6
1965	6,886.1	5,035.0	1,591.8	232.2	24.1	3.0
1966	7,718.5	5,857.9	1,637.4	188.3	28.1	6.8
1967	7,237.3	5,336.7	1,673.1	183.6	38.6	5.3
1968	6,666.7	4,595.3	1,890.2	146.5	29.0	5.7
1969	6,326.1	4,078.0	2,095.0	117.5	31.0	4.6
1970	5,453.2	3,565.2	1,756.1	102.6	24.0	5.3
1971	4,999.0	3,171.0	1,693.0	97.3	29.8	7.9
1972	4,771.8	3,194.9	1,470.0	59.6	37.4	9.9
1973	4,719.4	3,069.4	1,557.0	51.1	29.4	12.5
1974	4,853.9	2,960.4	1,777.0	38.8	64.0	13.7
1975	4,890.8	2,950.9	1,831.1	34.3	63.6	10.9
1976	5,313.9	3,336.3	1,864.4	25.7	71.1	16.4
Tr.Qtr.	1,361.0	868.6	458.1	7.5	23.2	3.6
1977	5,559.1	3,599.5	1,832.7	22.2	86.9	17.8
1978	6,188.2	3,582.4	2,457.0	28.6	100.7	19.5
1979	6,808.3	3,743.9	2,891.8	54.7	97.4	20.5
1980	7,667.7	4,340.1	3,162.3	48.8	88.7	27.8
1981	9,165.5	4,877.1	4,130.5	46.9	81.0	30.0
1982	10,466.2	5,463.3	4,771.5	59.5	142.4	29.5
1983	12,590.4	6,100.9	6,246.7	39.6	178.0	25.2
1984	14,726.1	6,461.4	8,000.2	33.4	208.7	22.4
1985	17,254.8	6,607.4	10,441.3	34.0	155.4	16.7
1986	18,581.0	6,756.0	11,448.5	34.7	316.9	24.9
1987	21,843.9	7,254.0	14,264.3	37.4	261.9	26.3
1988	23,414.1	8,450.5	14,397.4	199.1	333.9	33.2
1989	25,077.3	10,195.2	14,264.5	236.7	344.3	36.6
1990[E]	27,052.4	11,111.3	15,457.6	210.9	230.9	38.7

Source: NASA, "Aeronautics and Space Report of the President" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Excludes amounts for air transportation.
b Departments of Interior and Agriculture, and the National Science Foundation. NSF funding transferred to NASA after 1982.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

FEDERAL SPACE ACTIVITIES OUTLAYS IN CONSTANT DOLLARS[a]

Fiscal Years 1961-1990
(Millions of Constant Dollars, 1982 = 100)

Year	TOTAL	NASA[b]	DOD	Energy	Commerce	Other[c]
1961	$ 4,668.9	$ 2,206.1	$2,258.3	$204.5	$ —	$ —
1962	7,458.1	3,830.9	3,215.0	406.3	3.1	2.8
1963	12,518.7	7,725.0	4,197.4	555.6	37.4	3.4
1964	17,941.9	12,500.2	4,730.7	666.0	37.2	7.9
1965r	20,403.3	14,918.5	4,716.4	688.0	71.4	8.9
1966	22,217.9	16,862.1	4,713.3	542.0	80.9	19.6
1967	20,142.8	14,853.0	4,656.6	511.0	107.4	14.8
1968	17,926.1	12,356.3	5,082.5	393.9	78.0	15.3
1969	16,138.0	10,403.1	5,344.4	299.7	79.1	11.7
1970	13,146.6	8,595.0	4,233.6	247.3	57.9	12.8
1971	11,449.8	7,262.9	3,877.7	222.9	68.3	18.1
1972	10,360.0	6,936.4	3,191.5	129.4	81.2	21.5
1973	9,760.9	6,348.3	3,220.3	105.7	60.8	25.9
1974	9,305.8	5,675.6	3,406.8	74.4	122.7	26.3
1975	8,502.8	5,130.2	3,183.4	59.6	110.6	18.9
1976	8,559.8	5,374.2	3,003.2	41.4	114.5	26.4
Tr. Qtr.	2,108.3	1,345.5	709.6	11.6	35.9	5.6
1977	8,293.5	5,370.0	2,734.1	33.1	129.6	26.6
1978	8,628.3	4,995.0	3,425.8	39.9	140.4	27.2
1979	8,739.8	4,806.0	3,712.2	70.2	125.0	26.3
1980	9,048.5	5,121.7	3,731.8	57.6	104.7	32.8
1981r	9,833.2	5,232.4	4,431.4	50.3	86.9	32.2
1982	10,466.2	5,463.3	4,771.5	59.5	142.4	29.5
1983	12,079.4	5,853.3	5,993.2	38.0	170.8	24.2
1984	13,611.3	5,972.3	7,394.6	30.9	192.9	20.7
1985r	15,471.0	5,924.3	9,361.9	30.5	139.3	15.0
1986r	16,226.5	5,899.9	9,997.8	30.3	276.7	21.7
1987	18,507.1	6,145.9	12,085.3	31.7	221.9	22.3
1988	19,251.9	6,948.3	11,838.0	163.7	274.5	27.3
1989	19,786.4	8,044.2	11,254.9	186.8	271.7	28.9
1990E	20,509.8	8,424.0	11,719.2	159.9	175.1	29.3

Source: AIA, derived from NASA, "Aeronautics and Space Report of the President" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Based on fiscal year GNP implicit price deflator.
b Excludes amounts for air transportation.
c Departments of Interior and Agriculture, and the National Science Foundation. NSF funding transferred to NASA after 1982.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

FEDERAL SPACE ACTIVITIES BUDGET AUTHORITY

Fiscal Years 1961-1990
(Millions of Current Dollars)

Year	TOTAL	NASA[a]	DOD	Energy	Commerce	Other[b]
1961	$ 1,808	$ 926	$ 814	$ 68	$ —	$ 1
1962	3,295	1,797	1,298	148	51	1
1963	5,435	3,626	1,550	214	43	2
1964	6,831	5,016	1,599	210	3	3
1965	6,956	5,138	1,574	229	12	3
1966	6,970	5,065	1,689	187	27	3
1967	6,710	4,830	1,664	184	29	3
1968	6,529	4,430	1,922	145	28	4
1969	5,976	3,822	2,013	118	20	3
1970	5,341	3,547	1,678	103	8	4
1971	4,741	3,101	1,512	95	27	5
1972	4,575	3,071	1,407	55	31	10
1973	4,825	3,093	1,623	54	40	15
1974	4,640	2,759	1,766	42	60	14
1975	4,914	2,915	1,892	30	64	13
1976	5,320	3,225	1,983	23	72	16
Tr.Qtr.	1,341	849	460	5	22	4
1977	5,983	3,440	2,412	22	91	18
1978	6,518	3,623	2,738	34	103	20
1979	7,244	4,030	3,036	59	98	21
1980	8,689	4,680	3,848	40	93	28
1981	9,978	4,992	4,828	41	87	30
1982	12,441	5,528	6,679	61	145	29
1983	15,589	6,328	9,019	39	178	25
1984	17,136	6,648	10,195	34	236	22
1985	20,167	6,925	12,768	34	423	17
1986	21,659	7,165	14,126	35	309	25
1987	26,448	9,809	16,287	48	278	27
1988	26,607	8,302	17,679	241	352	33
1989	28,644	10,098	17,906	240	362	38
1990[E]	31,251	11,393	19,382	190	243	42

Source: NASA, "Aeronautics and Space Report of the President" (Annually).
Note: Detail may not add to totals because of rounding.
a Excludes amounts for air transportation.
b Departments of Interior and Agriculture, and the National Science Foundation. NSF funding transferred to NASA after 1982.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

FEDERAL SPACE ACTIVITIES BUDGET AUTHORITY IN CONSTANT DOLLARS[a]

Fiscal Years 1961-1990
(Millions of Constant Dollars, 1982 = 100)

Year	TOTAL	NASA[b]	DOD	Energy	Commerce	Other[c]
1961	$ 5,751	$ 2,945	$ 2,589	$216	$ —	$ 3
1962	10,297	5,616	4,056	463	159	3
1963	16,682	11,130	4,758	657	132	6
1964	20,669	15,177	4,838	635	9	9
1965[r]	20,610	15,224	4,664	679	36	9
1966	20,063	14,580	4,862	538	78	9
1967	18,675	13,443	4,631	512	81	8
1968	17,556	11,912	5,168	390	75	11
1969	15,245	9,750	5,135	301	51	8
1970	12,876	8,551	4,045	248	19	10[r]
1971	10,859	7,103	3,463	218	62	11
1972	9,933	6,667	3,055	119	67	22
1973	9,979	6,397	3,357	112	83	31
1974	8,896	5,289	3,386	81	115	27
1975	8,543	5,068	3,289	52	111	23
1976	8,570	5,195	3,194	37	116	26
Tr.Qtr.	2,077	1,315	713	8	34	6
1977	8,926	5,132	3,598	33	136	27
1978	9,088	5,052	3,818	47	144	28
1979	9,299	5,173	3,897	76	126	27
1980	10,254	5,523	4,541	47	110	33
1981	10,704[r]	5,355[r]	5,179[r]	44	93	32
1982	12,441	5,528	6,679	61	145	29
1983	14,956	6,071	8,653	37	171	24
1984	15,839	6,145	9,423	31	218	20
1985[r]	18,082	6,209	11,448	30	379	15
1986	18,915	6,257	12,336	31	270	22
1987	22,408	8,311	13,799	41	236	23
1988	21,877	6,826	14,536	198	289	27
1989	22,601	7,967	14,128	189	286	30
1990[E]	23,693	8,638	14,694	144	184	32

Source: AIA, derived from NASA, "Aeronautics and Space Report of the President" (Annually).
a Based on fiscal year GNP implicit price deflator.
b Excludes amounts for air transportation.
c Departments of Interior and Agriculture, and the National Science Foundation. NSF funding transferred to NASA after 1982.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION BUDGET AUTHORITY

Fiscal Years 1963-1991
(Millions of Current Dollars)

Year	TOTAL	Research and Development	Space Flight Control and Data Communications[a]	Construction of Facilities	Research & Program Management
1963	$ 3,673	$2,929	$ —	$744	$ (b)
1964	5,099	3,890	—	713	496
1965	5,250	4,360	—	267	623
1966	5,175	4,502	—	61	602
1967	4,968	4,235	—	85	648
1968	4,589	3,912	—	38	639
1969	3,995	3,314	—	33	648
1970	3,749	2,993	—	53	703
1971	3,312	2,556	—	26	730
1972	3,308	2,523	—	53	732
1973	3,408	2,599	—	79	730
1974	3,040	2,194	—	101	745
1975	3,231	2,323	—	143	765
1976	3,552	2,678	—	82	792
Tr.Qtr.	932	700	—	11	221
1977	3,819	2,856	—	118	845
1978	4,064	3,012	—	162	890
1979	4,559	3,477	—	148	934
1980	5,243	4,088	—	159	996
1981	5,522	4,334	—	117	1,071
1982	6,020	4,772	—	114	1,134
1983	6,875	5,539	—	139	1,197
1984	7,316	2,064[a]	3,772	223	1,256
1985	7,573	2,468	3,594	178	1,332
1986	7,807	2,619	3,670	176	1,342
1987	10,923	3,154	6,100	217	1,453
1988	9,062	3,280	3,806	213	1,763
1989	10,969	4,213	4,555	275	1,927
1990[E]	12,323	5,246	4,581	463	2,023
1991[E]	15,239	7,074	5,403	498	2,253

Source: Office of Management and Budget, "Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Separate budget category beginning in FY 84; funds formerly included under Research and Development.
b Included in Research and Development for one year.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION BUDGET AUTHORITY IN CONSTANT DOLLARS[a]

Fiscal Years 1963-1991
(Millions of Constant Dollars, 1982 = 100)

Year	TOTAL	Research and Development	Space Flight Control and Data Communications[b]	Construction of Facilities	Research & Program Management
1963	$11,274	$ 8,990	$ —	$2,284	$ (c)
1964	15,428	11,770	—	2,157	1,501
1965r	15,556	12,919	—	791	1,846
1966	14,896	12,959	—	176	1,733
1967	13,827	11,787	—	237	1,804
1968	12,339	10,519	—	102	1,718
1969	10,191	8,454	—	84	1,653
1970	9,038	7,216	—	128	1,695
1971	7,586	5,854	—	60	1,672
1972	7,182	5,478	—	115	1,589
1973	7,049	5,375	—	163	1,510
1974	5,828	4,206	—	194	1,428
1975	5,617	4,039	—	249	1,330
1976	5,722	4,314	—	132	1,276
Tr.Qtr.	1,444	1,084	—	17	342
1977	5,697	4,261	—	176	1,261
1978	5,666	4,200	—	226	1,241
1979	5,852	4,463	—	190	1,199
1980	6,187	4,824	—	188	1,175
1981	5,924	4,650r	—	126	1,149
1982	6,020	4,772	—	114	1,134
1983	6,596	5,314	—	133	1,148
1984	6,762	1,908[b]	3,486	206	1,161
1985	6,790	2,213	3,222	160	1,194
1986	6,818	2,287	3,205	154	1,172
1987	9,254	2,672	5,168	184	1,231
1988	7,451	2,697	3,129	175	1,450
1989	8,655	3,324	3,594	217	1,520
1990E	9,343	3,977	3,473	351	1,534
1991E	11,082	5,144	3,929	362	1,638

Source: AIA, derived from "Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Based on fiscal year GNP implicit price deflator.
b Separate budget category beginning in FY 84; funds formerly included under Research and Development.
c Included in Research and Development for one year.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION OUTLAYS

Fiscal Years 1963-1991
(Millions of Current Dollars)

Year	TOTAL	Research and Development	Space Flight Control and Data Communications[a]	Construction of Facilities	Research & Program Management
1963	$ 2,552	$1,912	$ —	$225	$ 416
1964	4,171	3,317	—	438	416
1965	5,093	3,984	—	531	578
1966	5,933	4,741	—	573	619
1967	5,426	4,487	—	289	650
1968	4,724	3,946	—	126	652
1969	4,251	3,530	—	65	656
1970	3,753	2,992	—	54	707
1971	3,382	2,630	—	44	708
1972	3,422	2,623	—	50	749
1973	3,315	2,541	—	45	729
1974	3,256	2,421	—	75	760
1975	3,266	2,420	—	85	761
1976	3,669	2,749	—	121	799
Tr.Qtr.	952	731	—	26	195
1977	3,945	2,980	—	105	860
1978	3,983	2,989	—	124	870
1979	4,196	3,139	—	133	925
1980	4,852	3,702	—	140	1,010
1981	5,426	4,228	—	147	1,050
1982	6,035	4,796	—	109	1,130
1983	6,664	5,316	—	108	1,240
1984	7,048	2,792[a]	2,915	109	1,232
1985	7,251	2,118	3,707	170	1,322
1986	7,403	2,615	3,267	189	1,332
1987	7,591	2,436	3,597	149	1,409
1988	9,092	2,916	4,362	166	1,648
1989	11,051	3,922	5,030	190	1,908
1990[E]	12,025	4,655	5,118	241	2,003
1991[E]	14,136	6,231	5,304	371	2,218

Source: Office of Management and Budget, "Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Separate budget category beginning FY 84; funds formerly included under Research and Development.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION OUTLAYS IN CONSTANT DOLLARS[a]

Fiscal Years 1963-1991
(Millions of Constant Dollars, 1982 = 100)

Year	TOTAL	Research and Development	Space Flight Control and Data Communications[b]	Construction of Facilities	Research & Program Management
1963	$ 7,833	$ 5,869	$ —	$ 691	$1,277
1964	12,620	10,036	—	1,325	1,259
1965[r]	15,090	11,804	—	1,573	1,713
1966	17,078	13,647	—	1,649	1,782
1967	15,102	12,488	—	804	1,809
1968	12,702	10,610	—	339	1,753
1969	10,844	9,005	—	166	1,673
1970	9,048	7,213	—	130	1,704
1971	7,746	6,024	—	101	1,622
1972	7,429	5,695	—	109	1,626
1973	6,856	5,255	—	93	1,508
1974	6,242	4,641	—	144	1,457
1975	5,678	4,207	—	148	1,323
1976	5,910	4,428	—	195	1,287
Tr.Qtr.	1,474	1,132	—	40	302
1977	5,885	4,446	—	157	1,283
1978	5,554[r]	4,168	—	173	1,213
1979	5,386	4,030	—	171	1,187
1980	5,726	4,369	—	165	1,192
1981	5,821	4,536	—	158	1,126
1982	6,035	4,796	—	109	1,130
1983	6,394	5,100	—	104	1,190
1984	6,514	2,581[b]	2,694	101	1,139
1985	6,501	1,899	3,324	152	1,185
1986[r]	6,465	2,284	2,853	165	1,163
1987[r]	6,431	2,064	3,048	126	1,194
1988[r]	7,476	2,398	3,587	136	1,355
1989	8,719	3,095	3,969	150	1,505
1990[E]	9,117	3,529	3,880	183	1,519
1991[E]	10,280	4,531	3,857	270	1,613

Source: AIA, derived from "Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Based on fiscal year GNP implicit price deflator.
b Separate budget category beginning in FY 84; funds formerly included under Research and Development.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION BUDGET AUTHORITY FOR RESEARCH AND DEVELOPMENT AND SPACE FLIGHT, CONTROL, & DATA COMMUNICATIONS

Fiscal Years 1990-1991
(Millions of Dollars)

	1990[E]	1991[E]
RESEARCH AND DEVELOPMENT—TOTAL	$5,246	$7,074
Space Station—Total	$1,750	$2,451
Space Transport Capability Development—Total	562	773
Space Science & Applications—Total	2,004	2,482
Physics and Astronomy	861	985
Planetary Exploration	392	485
Life Sciences	106	163
Space Applications	645	848
Commercial Use of Space—Total	57	101
Aeronautics & Space Technology—Total	795	1127
Aeronautical Research & Technology	450	512
Space Research & Technology	286	496
Transatmospheric Research & Technology	59	119
Safety, Reliability, & Quality Assurance—Total	23	33
Tracking & Data Advanced Systems—Total	20	20
SPACE FLIGHT, CONTROL, AND DATA COMMUNICATIONS—TOTAL	$4,556	$5,289
Space Shuttle Production & Capability Development—Total	$1,120	$1,302
Orbiter	219	214
Launch & Mission Support	259	266
Propulsion Systems	642	823
Space Shuttle Operations—Total	2,494	2,889
Flight Operations	759	816
Flight Hardware	1,205	1,467
Launch & Landing Operations	530	607
Expendable Launch Vehicles	142	229
Space and Ground Networks, Communications, & Data Systems—Total	975	869

Source: "NASA Budget Briefing Background Material" (Annually).
NOTE: Detail may not add to totals because of rounding.
E Estimate. Latest year reflects Administration's budget proposal.

DEPARTMENT OF DEFENSE SPACE PROGRAMS[a] PROCUREMENT (INCLUDING INITIAL SPARES) AND RDT&E

Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Agency and Program	1989		1990[E]		1991[E]	
	Procurement	RDT&E	Procurement	RDT&E	Procurement	RDT&E
AIR FORCE						
Advanced Launch System	$ —	$ —	$ —	$ 86.2	$ —	$ 60.3
Defense Meteorological Satellite Program (DMSP)	157.3	51.4	116.6	47.6	147.8	49.7
Defense Satellite Communications System (DSCS)	53.7	32.6	48.2	25.1	63.9	16.5
Medium Launch Vehicle	255.4	—	164.9	—	269.7	—
Navstar Global Positioning System	74.4	46.4	48.0	32.9	201.9	48.9
Space Boosters	339.8	462.1	230.3	361.5	208.6	234.3
Space Shuttle Operations	6.6	37.7	28.2	54.6	15.1	19.1
NAVY						
Fleet Satellite Communications (Fltsatcom)	$173.6	$ 16.4	$312.6	$ 15.9	$249.6	$ 13.7
JOINT PROGRAMS						
Strategic Defense Initiative	$ —	$3,627	$ —	$3,571	$ —	$4,460
National Aerospace Plane	—	228	—	193	—	158

Source: Department of Defense, "Program Acquisition Costs by Weapon System" (Annually).
a Total Obligational Authority.
E Estimate. Latest year reflects Administration's budget proposal.

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
PROGRAM FUNDING BY FUNCTION

Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Program Function	1989	1990[E]	1991[E]
TOTAL FUNDING	$3,950.7	$3,819.1	$4,663.3
DOE FUNDING	$ 240.3	$ 214.4	$ 191.9
DOD FUNDING	3,950.7	3,819.1	4,663.3
MILCON	83.3	33.5	11.4
RDT&E	3,627.4	3,571.2	4,460.0
DOD RDT&E			
INITIAL SYSTEMS:			
Systems Engineering	$ 86.1	$ 121.2	$ 135.0
Sensors, Command Center, and System Integration Function	522.9	594.8	887.2
Boost STS	233.1	300.0	402.0
Space-Based STS	93.0	78.0	95.0
Ground-Based STS	10.4	40.0	100.0
Ground-Based Radar (GBR)	71.0	89.0	150.0
CC/SOIF Systems	115.5	87.8	140.2
Initial Kinetic Energy Weapons	324.8	329.7	524.0
Brilliant Pebbles	46.0	129.0	329.0
Weapons Systems	116.0	73.0	53.0
Ground-Based Interceptor (GBI)	162.8	127.7	142.0
System Validation	233.7	245.8	277.6
National Test Bed	112.9	125.0	140.0
Independent T&E Oversight	4.8	4.3	5.5
T&E Resources	15.0	46.8	58.0
Advanced Research Center	13.4	13.5	13.8
Midcourse Space Experiment	87.6	56.2	40.3
System Simulator Level II	—	—	20.0
FOLLOW-ON SYSTEMS:			
Follow-on Directed Energy	409.2	363.0	506.0
Free Electron Laser (FEL)	202.7	129.8	130.0
Chemical Laser	99.4	116.8	211.0
Neutral Particle Beam (NPB)	107.6	116.4	165.0
Sensor Technology	597.7	498.6	630.6
Passive Sensor	70.3	57.1	65.2
Radar	14.3	—	10.0
Laser Radar	80.3	59.0	67.5
Signal Processing	80.2	67.0	77.4
Discrimination	179.0	133.9	170.0
Sensor Studies and Experiments	165.5	181.8	240.5
Interactive Discrimination	8.0	(a)	(a)

(Continued on Next Page)

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
PROGRAM FUNDING BY FUNCTION (Continued)

Program Function	1989	1990[E]	1991[E]
FOLLOW-ON SYSTEMS (continued):			
CC/SOIF	$ —	$ 7.0	$ 8.7
Follow-on Kinetic Energy Concepts	136.9	86.2	120.1
Hypervelocity Technologies	23.9	20.2	25.1
HEDI	113.0	66.0	95.0
Interceptor Technology	207.5	193.1	241.4
Component Technology	92.6	85.5	106.0
Integration Technology	67.1	95.1	115.0
Studies and Analysis	47.8	12.5	20.4
Directed Energy Technology	285.9	304.5	254.3
Nuclear Directed Energy	21.4	13.0	15.0
ATP/FC	237.2	273.5	225.0
DEW Systems	22.6	8.0	12.0
Strategic Defense Facility	4.7	10.0	2.3
KEY TECHNOLOGIES	304.5	265.2	308.0
Survivability	102.8	107.1	136.0
Lethality and Target Hardening	62.0	38.9	40.0
Power and Power Conditioning	108.9	83.6	90.0
Materials and Structures	30.8	35.6	42.0
THEATER DEFENSE	103.1	130.2	143.6
Foreign Technology Support	15.2	5.5	11.8
Theater Interceptors	60.5	84.5	75.2
TMD Special Studies	19.8	13.6	15.7
Theater and Test Beds	7.6	26.6	40.9
SPACE TRANSPORTATION	57.4	32.0	27.0
INNOVATIVE SCIENCES	113.8	113.4	116.8
TECHNOLOGY APPLICATIONS	17.7	23.0	23.4
COUNTERMEASURES	17.2	17.1	22.4
MANAGEMENT	208.6	246.5	234.0

Source: Strategic Defense Initiative Organization, "1990 Report to the Congress on the Strategic Defense Initiative" (Annually).

a Funding transferred to another program.

E Estimate. Latest two years represent Administration's budget request.

KEY: ATP/FC = Acquisition, Tracking, Pointing/Fire Control
DEW = Directed Energy Weapon
DOD = Department of Defense
DOE = Department of Energy
HEDI = High Endoatmospheric Defense Interceptor
RTD&E = Research, Development, Test, & Evaluation
STS = Surveillance and Tracking System
T&E = Test and Evaluation
TMD = Theater Missile Defense

AIR TRANSPORTATION

90-91

For the U.S. air carrier industry, 1989 was a frustrating year in which the airlines recorded record levels of traffic and revenues but their operating profit dropped sharply as increasing expenses outpaced revenue growth.

U.S. carriers generated operating revenues of $69.2 billion in combined domestic/international operations, a figure that represents an increase of 8.7 percent over 1988 revenues of $63.7 billion. Operating expenses, however, increased by nearly 12 percent (from $60.2 billion in 1988 to $67.3 billion in 1989) and the operating profit fell to $1.9 billion, down from $3.4 billion in the previous year.

Domestic operations accounted for 78 percent of total revenues and well over 90 percent of the profit. Domestic revenues of $54.1 billion produced an operating profit of $1.8 billion; the comparable figures for 1988 were $50.2 billion and $2.4 billion.

In U.S. airline international service, operating revenues continued on the sharply rising curve evident in recent years—to $15.1 billion, up from $13.4 billion in 1988. Operating expenses, however, climbed at a steeper rate and almost matched revenues, leaving an operating profit of only $57 million.

The upward trend in traffic aboard U.S. scheduled airlines, in evidence since 1982, continued but at a lower rate: 3.1 percent gain (compared with 6.6 percent in 1988) in revenue ton miles to 55.5 billion (up from 53.8 billion).

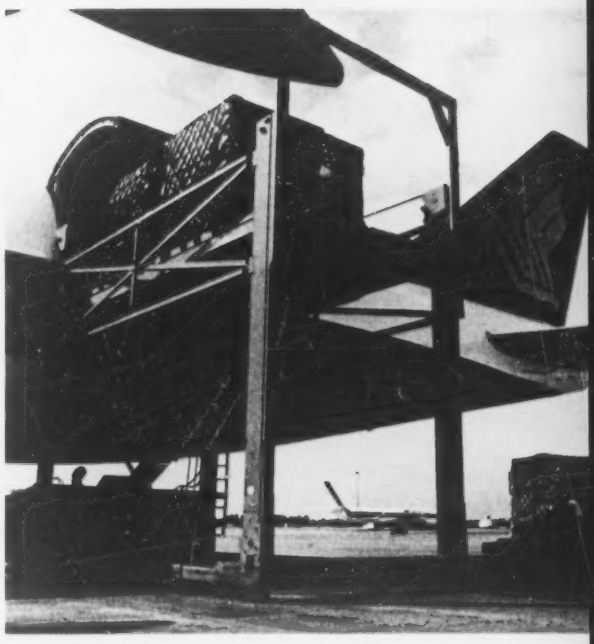
A breakdown for 1989 shows 43.3 billion passenger revenue ton miles and 12.2 billion cargo revenue ton miles, both records. The total revenue load factor increased to 55.4 percent from 55 percent in the previous year.

In domestic service, U.S. scheduled carriers boarded more than 416 million passengers, down from 1988's 419 million, but passenger revenue miles increased from 329.3 billion in 1988 to 330 billion in 1989. The domestic service load factor was 62.3 percent, up from 61.4 percent.

Growth continued in international traffic carried by U.S. scheduled airlines. At a record 37.4 million, enplanements were up almost six percent over 1988's 35.4 million. Passenger revenue miles totaled 102.7 billion, compared with 94 billion in the previous year. Load factor, however, fell from 1988's all-time high of 67.1 percent to 66.6 percent in 1989.

Global airline service also showed gains in operating revenues and traffic. In scheduled operations by airlines of the International Civil Aviation Organization, operating revenues amounted to $182.5 billion, up from the previous year's $166.2 billion. Here again, mounting expenses outpaced revenue growth; operating expenses were $174 billion, up from $156 billion. The operating result (gross profit) was $8.5 billion or 4.7 percent of revenue; this compares with an operating result for 1988 of $10.2 billion, 6.1 percent of revenue.

The world fleet of turbine engine aircraft in airline service expanded by 939 units, according to Exxon International Company's annual survey, which covers aircraft in service as of March 31, 1989, excluding the Soviet national airline Aeroflot and air taxi operations. Exxon reported a total of 13,514 active aircraft (up from 12,575) including 8,587 turbojets (up from 8,085); 4,687 turboprops (up from 4,219); and 240 turbine-powered helicopters (down from 271).



Exxon's analysis shows that the percentage of U.S.-manufactured airliners continued to decline, but U.S. manufacturers still account for almost two out of every three turbine-powered aircraft in the world fleet. For 1989, the percentage was 64.1, marking a third consecutive drop from 66.2 percent in 1986 to 65.7 percent in 1987 and 65.2 percent in 1988. Among turbojet aircraft in world airline service, the number manufactured in the U.S. amounted to 81.9 percent (down from 82.8 percent in 1988).

OPERATING REVENUES AND EXPENSES OF WORLD SCHEDULED AIRLINES[a]

Calendar Years 1984-1989
(Millions of U.S. Dollars)

	1984	1985	1986	1987[r]	1988	1989[p]
OPERATING REVENUES:						
Scheduled Services:						
Passenger	$ 81,720	$ 87,000	$ 94,900	$111,600	$127,250	
Freight	12,560	13,300	15,200	17,350	19,380	
Mail	1,500	1,700	1,800	1,980	2,050	
Total Scheduled Services	$ 95,780	$102,000	$111,900	$130,930	$148,680	NA
Non-Scheduled Services	3,010	3,500	4,500	5,640	6,360	
Incidental	6,610	6,700	8,200	10,430	11,160	
Total Operating Revenues	$105,400	$112,200	$124,600	$147,000	$166,200	$182,500
OPERATING EXPENSES:						
Flight Operations	$ 33,350	$ 34,930	$ 32,710	$ 37,390	$ 39,270	
Maintenance & Overhaul	10,120	11,070	13,850	15,960	18,320	
Depreciation & Amortization	7,240	7,770	9,070	10,820	12,150	
User Charges & Station Expenses	16,080	17,340	21,340	24,410	28,440	NA
Passenger Services	9,190	10,310	12,140	14,260	15,900	
Ticketing, Sales & Promotion	16,560	18,470	21,480	24,570	27,080	
General, Administrative & Other	7,760	8,210	9,410	12,390	14,840	
Total Operating Expenses	$100,300	$108,100	$120,000	$139,800	$156,000	$174,000
OPERATING RESULT	$ 5,100	$ 4,100	$ 4,600	$ 7,200	$ 10,200	$ 8,500
Percent of Revenue	4.8%	3.7%	3.7%	4.9%	6.1%	4.7%
NET RESULT[b]	$ 2,000	$ 2,100	$ 1,500	$ 2,500	$ 5,000	NA
Percent of Revenue	1.9%	1.9%	1.2%	1.7%	3.0%	NA

Source: International Civil Aviation Organization, "Civil Aviation Statistics of the World" (Annually).
a Excludes domestic operations in the USSR.
b Net Result equals Operating Result minus non-operating items, including interest, income taxes, retirement of property and equipment, affiliated companies, and subsidies.
NA Not available.
p Preliminary.
r Revised.

TRAFFIC STATISTICS
WORLD AIRLINE SCHEDULED SERVICE[a]

Calendar Years 1970-1989

Year	Passengers Carried	Freight Tons Carried	Passenger-Miles Performed	Seat-Miles Available	Passenger Load Factor	Ton-Miles Performed		
						Freight	Mail	TOTAL (Passengers & Baggage, Freight, Mail)
	(Millions)		(Billions)		(Percent)	(Millions)		
1970	383	6.7	286	522	55%	8,180	2,150	38,810
1971	411	7.4	307	568	54	9,060	1,990	41,420
1972	450	8.0	348	609	57	10,290	1,900	46,690
1973	489	9.0	384	667	58	12,010	1,970	51,910
1974	515	9.5	408	688	59	13,030	1,980	55,270
1975	534	9.6	433	733	59	13,270	1,990	58,080
1976	576	10.3	475	789	60	14,750	2,080	63,880
1977	610	11.1	508	837	61	16,190	2,180	68,790
1978	679	11.7	582	902	65	17,770	2,240	77,770
1979	754	12.1	659	999	66	19,190	2,350	86,900
1980	748	12.2	677	1,071	63	20,120	2,520	89,710
1981	752	12.0	695	1,091	64	21,150	2,600	92,800
1982	766	12.8	710	1,115	64	21,600	2,650	94,830
1983	798	13.5	739	1,151	64	24,050	2,740	100,270
1984[r]	848	14.8	794	1,226	65	27,170	2,950	109,040
1985[r]	899	15.1	850	1,293	66	27,290	3,010	114,860
1986[r]	960	16.2	902	1,389	65	29,580	3,110	122,470
1987[r]	1,027	17.7	987	1,471	67	33,130	3,210	134,540
1988	1,080	19.1	1,059	1,570	67	36,580	3,310	145,290
1989[p]	1,116	19.8	1,112	1,630	68	39,400	3,470	153,480

Source: International Civil Aviation Organization (ICAO).

a Includes international and domestic traffic on scheduled service performed by the airlines of the 162 States which were members of ICAO in 1989.

p Preliminary.

r Revised.

OPERATING REVENUES AND EXPENSES OF U.S. AIR CARRIERS[a] DOMESTIC AND INTERNATIONAL OPERATIONS

Calendar Years 1964-1989
(Millions of Dollars)

Year	TOTAL OPERATIONS[b]			Domestic Operations			International Operations		
	Operating Revenues	Operating Expenses	Operating Profit (or Loss)	Operating Revenues	Operating Expenses	Operating Profit (or Loss)	Operating Revenues	Operating Expenses	Operating Profit (or Loss)
1964	$ 4,251	$ 3,781	$ 470	$ 3,169	$ 2,849	$ 320	$ 1,082	$ 932	$ 150
1965	4,958	4,286	672	3,691	3,239	452	1,267	1,047	220
1966	5,745	4,970	775	4,171	3,670	502	1,574	1,300	274
1967	6,865	6,157	708	4,981	4,560	421	1,884	1,597	287
1968	7,753	7,248	505	5,691	5,397	295	2,062	1,852	210
1969	8,791	8,403	387	6,936	6,613	322	1,855	1,790	65
1970	9,290	9,247	43	7,180	7,181	(1)	2,109	2,066	44
1971	10,046	9,717	328	7,753	7,496	257	2,292	2,221	71
1972	11,163	10,578	584	8,652	8,158	493	2,512	2,420	91
1973	12,419	11,834	585	9,694	9,200	494	2,725	2,633	91
1974	14,703	13,978	725	11,546	10,761	785	3,157	3,218	(60)
1975	15,356	15,229	128	12,020	11,903[r]	117	3,336	3,326	11
1976	17,503	16,781	721	13,899	13,324	575	3,605	3,457	147
1977	19,926	19,018	908	15,822	15,166	657	4,104	3,852	252
1978	22,892	21,527	1,366	18,189	17,172	1,018	4,703	4,355	348
1979	27,227	27,028	199	21,652	21,523	129	5,575	5,505	69
1980	33,728	33,949	(222)	26,404	26,409	(6)	6,543	6,766	(223)
1981	36,211	36,612	(401)	28,788	29,051	(264)	6,390	6,574	(184)
1982	36,066	36,804	(739)	28,728	29,478	(750)	6,435	6,452	(17)
1983	38,593	38,231	362	31,014	31,186	(171)	7,163	6,693	470
1984	44,060	41,946	2,114	35,394	33,812	1,582	7,975	7,485	490
1985	48,580	47,207	1,372	37,629[r]	36,611[r]	1,018	8,302	7,984	319
1986	50,086	48,855	1,231	41,001[r]	39,984[r]	1,060	8,621[r]	8,458[r]	163[r]
1987	56,787	54,339	2,448	45,658	43,925	1,733	10,925	10,226	698
1988[r]	63,679	60,236	3,443	50,187	47,739	2,448	13,402	12,403	998
1989[p]	69,211	67,347	1,864	54,071	52,260	1,810	15,076	15,019	57

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
NOTE: Detail may not add to totals because of rounding.
a Scheduled and non-scheduled service for all certificated route air carriers. Excludes supplemental air carriers, commuters, and air taxis.
b For 1980 and subsequent years, includes 'Other' operations not reported as 'Domestic' or 'International.'
p Preliminary.
r Revised.

SOURCES OF OPERATING REVENUES OF U.S. AIR CARRIERS[a] DOMESTIC AND INTERNATIONAL OPERATIONS

Calendar Years 1975-1989
(Millions of Dollars)

Year	TOTAL Operating Revenues	Passenger Service[b]	Mail[c]	Freight[b] & Air Express	Excess Baggage	Other[c]
DOMESTIC OPERATIONS						
1975	$12,020	$10,301	$253	$ 792	$19	$ 655
1976	13,899	12,104	294	942	22	537
1977	15,822	13,773	355	1,109	21	564
1978	18,189	15,753	336	1,347	23	730
1979	21,652	18,931	417	1,485	28	791
1980	26,404	23,317	446	1,582	32	1,027
1981	28,788	25,504	497	1,659	36	1,091
1982	28,728	25,440	524	1,505	42	1,218
1983	31,014	27,519	516	1,602	52	1,326
1984	35,393	31,437	552	1,716	70	1,618
1985	37,629[r]	33,343[r]	733	1,581[r]	78	1,895
1986	41,001[r]	33,814[r]	679	4,278	85	2,159
1987	45,658	37,492	704	4,952	67	2,443
1988[r]	50,187	41,002	789	5,807	72	2,518
1989[p]	54,071	43,600	767	6,932	70	2,702
INTERNATIONAL OPERATIONS						
1975	$ 3,336	$ 2,469	$122	$ 591	$25	$ 129
1976	3,605	2,665	112	626	27	175
1977	4,104	3,047	112	710	21	215
1978	4,703	3,534	117	750	20	282
1979	5,575	4,271	131	837	23	313
1980	6,543	4,984	175	1,011	25	348
1981	6,390	4,916[r]	165	984	25	299
1982	6,435	4,959	177	990	25	283[r]
1983	7,163	5,605	152	999	23	384
1984	7,975	6,074	158	1,169	27	546[r]
1985	8,302	6,451[r]	161[r]	1,130[r]	28	532[r]
1986	8,621[r]	6,551[r]	154	1,451	28	437[r]
1987	10,925	8,374	180	1,783	33	555
1988[r]	13,402	10,356	183	2,150	39	672
1989[p]	15,706	11,181	188	2,827	47	833

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
NOTE: Detail may not add to totals because of rounding.
a Scheduled and non-scheduled service for all certificated route air carriers. Excludes supplemental air carriers, commuters, and air taxis.
b Scheduled and charter.
c Subsidy included with Mail through 1979, and thereafter included in Other, which also includes revenues not related to transport, plus, beginning in 1981, transport revenues not specifically broken out by category by some small carriers.
p Preliminary.
r Revised.

OPERATING EXPENSES OF U.S. AIR CARRIERS[a] DOMESTIC AND INTERNATIONAL OPERATIONS

Calendar Years 1975-1989
(Millions of Dollars)

Year	TOTAL Operating Expenses	Flying Operations	Maintenance	Passenger Service	Aircraft & Traffic Servicing	Promotion and Sales	Depreciation & Amortization	Other[b]
DOMESTIC OPERATIONS								
1975	$11,902	$ 3,919	$1,611	$1,117	$ 2,158	$1,271	$ 891	$ 936
1976	13,324	4,448	1,816	1,260	2,443	1,495	927	935
1977	15,166	5,288	2,001	1,461	2,728	1,713	967	1,008
1978	17,172	5,669	2,155	1,711	3,120	2,040	1,231	1,246
1979	21,523	7,998	2,457	2,091	3,702	2,564	1,373	1,337
1980	26,409	11,029	2,758	2,329	4,051	3,096	1,560[r]	1,586[r]
1981	29,051	12,037	2,822	2,522	4,497	3,708	1,723	1,742
1982	29,478	11,529	2,709	2,668	4,665	4,160	1,876	1,869
1983	31,186	11,370	2,878	2,983	5,104	4,764	2,107	1,980
1984	33,812	12,161	3,176	3,192	5,369	5,310	2,223	2,380
1985	36,611[r]	12,684	3,604	3,464	5,781	6,089	2,318	2,670
1986	39,934[r]	11,368[r]	4,475[r]	3,793	7,680	6,820	2,652[r]	3,171
1987	43,925	12,509	4,951	4,169	8,575	7,399	2,855	3,468
1988[r]	47,739	13,176	5,643	4,444	9,527	8,235	2,977	3,737
1989[p]	52,260	14,661	6,166	4,765	10,527	8,792	3,153	4,196
INTERNATIONAL OPERATIONS								
1975	$ 3,326	$ 1,175	$ 392	$ 292	$ 565	$ 422	$ 225	$ 254
1976	3,457	1,215	399	300	597	473	205	268
1977	3,852	1,303	450	351	668	526	253	301
1978	4,355	1,351	498	427	768	623	323	363
1979	5,505	1,960	571	538	922	774	352	388
1980	6,766	2,775	616	600	1,049	917	385	423
1981	6,574	2,757	540	583	932	945	382	435
1982	6,452	2,596	512	577	893	954	396	525
1983	6,693	2,490	548	664	936	1,162	389	505
1984	7,485	2,629	677	749	975	1,308	446	701
1985	7,984	2,738	768	852	1,069	1,414	482	662
1986	8,458[r]	2,402[r]	901	877	1,386	1,665	518	711
1987	10,226	2,836	1,096	1,059	1,749	2,094	533	860
1988[r]	12,403	3,230	1,332	1,280	2,193	2,742	618	1,009
1989[p]	15,019	3,992	1,777	1,454	2,765	3,109	743	1,180

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
NOTE: Detail may not add to totals because of rounding.
a Scheduled and non-scheduled service for all certificated route air carriers. Excludes supplemental air carriers, commuters, and air taxis.
b General and administrative and other transport-related expenses.
p Preliminary.
r Revised.

U.S. AIR CARRIERS
TOTAL ASSETS AND INVESTMENT IN EQUIPMENT

Calendar Years 1969-1989
(Millions of Dollars)

Year	TOTAL Assets	Value of Flight Equipment	Value of Ground Property & Equipment, & Other[a]	Less: Reserves for Depreciation & Overhaul	Equals: Net Value of Owned Operating Property & Equipment	Investment in Operating Property and Equipment as a Percent of Total Assets
1969	$12,069	$ 9,943	$ 1,516	$ 3,560	$ 7,899	65.4%
1970	12,913	10,950	1,951	4,120	8,782	68.0
1971	12,998	11,221	2,028	4,649	8,600	66.2
1972	13,635	11,918	2,225	5,115	9,028	66.2
1973	14,464	12,908	2,424	5,693	9,639	66.6
1974	15,200	13,538	2,539	6,252	9,826	64.6
1975	15,064	14,035	2,635	6,823	9,847	65.4
1976	15,454	14,399	2,792	7,585	9,605	62.2
1977	16,869	14,822	2,997	8,141	9,679	57.4
1978	20,745	16,127	3,367	8,799	10,696	51.6
1979	24,907	18,561	3,985	9,746	12,800	51.4
1980	28,900	20,859	4,682	10,309	15,233	52.7
1981	30,513	22,375	5,175	11,028	16,521	54.1
1982	31,525	23,786	5,424	11,405	17,804	56.5
1983	35,213	26,588	6,191	12,910	19,868	56.4
1984	36,769	28,509	6,061	14,043	20,527	55.8
1985	40,978	30,402	6,772	15,467	21,707	53.0
1986	47,105	31,750	8,468	14,764	25,454	54.0
1987	51,436	33,177	9,223	15,580	26,820	52.1
1988	56,046	35,780	10,248	17,453	28,576	51.0
1989	62,007	38,682	11,804	19,008	31,477	50.8

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
a Includes land and construction in progress.

TRAFFIC STATISTICS
U.S. AIR CARRIER SCHEDULED SERVICE[a]
Calendar Years 1964-1989

Year	Revenue Ton Miles (Millions)			Total Available Ton Miles (Millions)	Total Revenue Load Factor	Aircraft Revenue Miles (Millions)	Average Over-All Flight Stage Length (Miles)	Average Available Seats per Aircraft Mile
	Passenger	Cargo[b]	Total					
1964	5,630	1,803	7,434	15,514	47.9%	1,189	301	93
1965	6,629	2,356	8,986	18,408	48.8	1,354	322	96
1966	7,736	2,949	10,686	20,939	51.0	1,482	339	98
1967	9,561	3,475	13,036	26,968	48.3	1,834	371	101
1968	11,023	4,226	15,249	33,221	45.9	2,146	401	107
1969	12,197	4,701	16,898	38,664	43.7	2,385	443	112
1970	13,171	4,994	18,166	41,693	43.6	2,426	473	117
1971	13,565	5,120	18,685	44,139	42.3	2,378	476	125
1972	15,241	5,506	20,746	45,583	45.5	2,376	471	129
1973	16,196	6,046	22,242	49,019	45.4	2,448	477	135
1974	16,292	6,133	22,425	46,848	47.9	2,258	478	140
1975	16,281	5,905	22,186	47,254	46.9	2,241	476	143
1976	17,899	6,222	24,121	49,325	48.9	2,320	480	146
1977	19,322	6,587	25,909	52,284	49.6	2,419	490	149
1978	22,678	7,001	29,679	54,765	54.2	2,520	502	152
1979	26,202	7,189	33,390	60,844	54.9	2,791	517	154
1980	25,519	7,084	32,603	62,983	51.8	2,816	526	158
1981	24,889	7,060	31,949	61,186	52.2	2,703	519	161
1982	25,964	6,886	32,850	62,401	52.6	2,699	544	167
1983	28,183	7,573	35,756	65,385	54.7	2,809	558	169
1984	30,512	8,185	38,697	72,223	53.6	3,134	575	168
1985	33,640	7,689	41,329	76,059	54.3	3,320	569	168
1986	36,655	9,026	45,681	85,140	53.7	3,725	580	168
1987	40,453	10,016	50,469	92,209	54.7	3,988	606	167
1988	42,330	11,470[r]	53,800[r]	97,899	55.0	4,141	618	169
1989	43,271	12,186	55,457	100,080	55.4	4,192	633	169

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
NOTE: Detail may not add to totals because of rounding.
a Includes international and domestic operations.
b Includes freight, air express, U.S. and foreign mail.
r Revised.

PASSENGER STATISTICS
U.S. AIR CARRIER SCHEDULED SERVICE
DOMESTIC AND INTERNATIONAL OPERATIONS

Calendar Years 1975-1989

Year	Revenue Passenger Enplanements (Thousands)	Average Passenger Trip-Length (Miles)	Revenue Passenger Miles (Millions)	Available Seat Miles (Millions)	Revenue Passenger Load Factor[a]
DOMESTIC OPERATIONS					
1975	188,746	698	131,728	241,282	54.6%
1976	206,279	704	143,271r	261,248	54.8r
1977	222,283	704r	156,609	280,619	55.8
1978	253,957	719	182,669	299,542	61.0
1979	292,700	714	208,891	332,796	62.8
1980	272,829	736	200,829	346,028	58.0
1981	265,304	749	198,715	346,172	57.4
1982	274,342	766	210,149	359,528	58.5
1983	296,721	765	226,909	379,150	59.8
1984	321,047	759	243,692	422,507	57.7
1985	357,109	758	270,584	445,826	60.7
1986	393,864	767	302,090	497,991	60.7
1987	416,831	779	324,637	526,958	61.6
1988	419,210	786	329,309	536,663	61.4
1989	416,331	792	329,975	530,079	62.3
INTERNATIONAL OPERATIONS					
1975	16,316	1,905	31,082	61,724	50.4%
1976	17,039	1,979	33,717	61,574	54.8
1977	18,043	2,029	36,610	64,947	56.4
1978	20,759	2,125	44,112	69,209	63.7
1979	24,163	2,199	53,132	83,330	63.8
1980	24,074	2,258	54,363	86,507	62.8
1981	20,672	2,427	50,173	78,725	63.7
1982	19,760	2,505	49,495	80,591	61.4
1983	21,917	2,506	54,920	85,388	64.3
1984	23,636	2,599	61,424	92,817	66.2
1985	24,913	2,642	65,819	101,963	64.6
1986	25,082	2,570	64,456	109,445	58.9
1987	30,847	2,588	79,834	121,763	65.6
1988	35,404	2,655	93,992	140,140	67.1
1989	37,361	2,750	102,739	154,297	66.6

Source: U.S. Department of Transportation, Office of Aviation Information Management, Financial Data Branch.
a Revenue passenger miles as a percent of available seat miles.
r Revised.

PERCENT OF CIVIL TURBOJET ENGINE MARKET BY MANUFACTURER AND AIRCRAFT MODEL

as of December 1989

Aircraft Manufacturer and Model	Total Installed Engines	Engine Manufacturers					
		P&W	GE	RR	CFM	IAE	Other
TOTAL ENGINES	30,016	15,932	3,067	2,596	1,834	54	6,533
PERCENT SHARE	100.0%	53.1%	10.2%	8.6%	6.1%	0.2%	21.8%
Airbus A300[a]	358	19%	81%	—%	—%	—%	—%
Airbus A300B4-200	262	12	89	—	—	—	—
Airbus A310	324	36	64	—	—	—	—
Airbus A320	142	—	—	—	62	38	—
Antonov AN-124	48	—	—	—	—	—	100
Antonov AN-225	6	—	—	—	—	—	100
AS Corvette	48	8	—	—	—	—	92
AS Caravelle	146	63	—	37	—	—	—
AS/BAe CONCORDE	56	—	—	100	—	—	—
BAe 1-11	438	—	—	100	—	—	—
BAe 146	532	—	—	—	—	—	100
BAe HS Trident	111	—	—	100	—	—	—
BAe HS 125	86	—	—	42	—	—	58
Beech 400	2	—	—	—	—	—	100
Boeing B-707[a]	452	95	—	2	4	—	—
Boeing B-707-320C	996	100	—	—	—	—	—
Boeing B-720	112	100	—	—	—	—	—
Boeing B-727 series[a]	414	100	—	—	—	—	—
Boeing B-727[b]	887	100	—	—	—	—	—
Boeing B-727C	377	100	—	—	—	—	—
Boeing B-727-200	891	100	—	—	—	—	—
Boeing B-727-200 ADV	2,712	100	—	—	—	—	—
Boeing B-737[a]	402	64	—	—	36	—	—
Boeing B-737-200	412	100	—	—	—	—	—
Boeing B-737-200 ADV	1,526	100	—	—	—	—	—
Boeing B-737-300	1,150	—	—	—	100	—	—
Boeing B-747[a]	1,580	56	30	13	—	—	—
Boeing B-747-100	484	100	—	—	—	—	—
Boeing B-747-200B	864	71	14	14	—	—	—
Boeing B-757[a]	48	63	—	38	—	—	—
Boeing B-757-200	462	42	—	58	—	—	—
Boeing B-767[a]	350	39	61	—	—	—	—
Boeing B-767-200	216	38	62	—	—	—	—
Canadair CL 600s	4	—	50	—	—	—	50
Cessna 500s	188	9	—	—	—	—	91
Cessna 650	10	—	—	—	—	—	100
Convair CV-880	92	—	100	—	—	—	—
Convair CV-990	12	—	100	—	—	—	—
Dassault Falcon	232	—	66	—	—	—	34
Dassault Mercure 100	22	100	—	—	—	—	—
Fokker F-28[a]	212	—	—	100	—	—	—
Fokker F-28-4000	226	—	—	100	—	—	—
Fokker 100	66	—	—	100	—	—	—

(Continued on next page)

PERCENT OF CIVIL TURBOJET ENGINE MARKET BY MANUFACTURER AND AIRCRAFT MODEL (Continued)

as of December 1989

Aircraft Manufacturer and Model	Total Installed Engines	Engine Manufacturers					
		P&W	GE	RR	CFM	IAE	Other
Learjet 23	22	—	100	—	—	—	—
Learjet 24	50	—	100	—	—	—	—
Learjet 25	60	—	100	—	—	—	—
Learjet 29	2	—	100	—	—	—	—
Learjet 35	130	—	—	—	—	—	100
Learjet 36	12	—	—	—	—	—	100
Learjet 55	22	—	—	—	—	—	100
Gulfstream II	16	—	—	100	—	—	—
Gulfstream III	20	—	—	100	—	—	—
IAI 1100s	28	—	7	—	—	—	93
Ilyushin IL-62[a]	356	—	—	—	—	—	100
Ilyushin IL-62M	572	—	—	—	—	—	100
Ilyushin IL-76	840	—	—	—	—	—	100
Ilyushin IL-86	288	—	—	—	—	—	100
Lockheed JetStar	52	62	—	—	—	—	38
Lockheed L-1011[a]	372	—	—	100	—	—	—
Lockheed L-1011-1	360	—	—	100	—	—	—
MBB Hansa	12	—	100	—	—	—	—
Douglas DC-8	1,308	67	—	—	33	—	—
Douglas DC-9[a]	652	100	—	—	—	—	—
Douglas DC-9-30	1,086	100	—	—	—	—	—
Douglas DC-10[a]	291	42	58	—	—	—	—
Douglas DC-10-10	354	—	100	—	—	—	—
Douglas DC-10-30	459	—	100	—	—	—	—
MDC MD-81	202	100	—	—	—	—	—
MDC MD-82	778	100	—	—	—	—	—
MDC MD-83	200	100	—	—	—	—	—
MDC MD-80s	178	100	—	—	—	—	—
Mitsubishi Diamond	10	—	—	—	—	—	100
Rockwell Sabre	14	86	—	—	—	—	14
Tupolev TU-134[a]	176	—	—	—	—	—	100
Tupolev TU-134A	354	—	—	—	—	—	100
Tupolev TU-154[a]	519	—	—	—	—	—	100
Tupolev TU-154B	339	—	—	—	—	—	100
Tupolev TU-154B2	954	—	—	—	—	—	100
Tupolev TU-154M	348	—	—	—	—	—	100
Yakolev YAK-40 series[a]	33	—	—	—	—	—	100
Yakolev YAK-40[b]	531	—	—	—	—	—	100
Yakolev YAK-42	57	—	—	—	—	—	100

Source: Aerospace Industries Association, based on data from Aviation Data Service.
a Data for major (100 or more aircraft) series excluded and reported separately.
b Series bearing same designation as model number, but qualifies for separate reporting as a major series.
KEY: AS = Aerospatiale; BAe = British Aerospace; CFM = CFM International; GE = General Electric; IAE = International Aero Engines; IAI = Israel Aircraft Industries; MDC = McDonnell Douglas; MBB = Messerschmitt-Boelkow-Blohm; P&W = Pratt & Whitney; RR = Rolls-Royce.

TURBINE-ENGINED AIRCRAFT IN THE WORLD AIRLINE FLEET

(By Model, 1985-1989)

	1985	1986	1987	1988	1989
TOTAL AIRCRAFT IN SERVICE	10,496	10,999	11,711	12,575	13,514
Turbojets—TOTAL	6,900	7,188	7,600	8,085	8,587
Aerospatiale SE-210 Caravelle	89	67	60	59	56
Aerospatiale SN-601 Corvette	12	11	11	12	12
Airbus A300	237	247	267	272	294
Airbus A310	50	79	94	116	147
Airbus A320	—	—	—	2	23
B.Ae./Aerospatiale Concorde	14	14	14	14	14
B.Ae. 146	21	37	59	82	102
B.Ae. One-Eleven	156	162	166	167	164
B.Ae. Trident	48	34	34	27	27
B.Ae. (HS) 125	11	14	18	16	17
Boeing 707/720	322	284	273	245	224
Boeing 727	1,658	1,678	1,676	1,686	1,684
Boeing 737	1,008	1,135	1,284	1,426	1,585
Boeing 747	571	597	629	653	676
Boeing 757	56	89	117	167	215
Boeing 767	106	133	163	207	254
Canadair CL-601 Challenger	—	—	—	1	—
Cessna 500/550/650 Citation I/II/III	36	29	28	37	48
Convair 880/990	11	10	12	2	2
Dassault Falcon 10/20/50	28	32	30	39	44
Dassault Mercure	11	11	11	11	11
Fokker F-28 Fellowship	171	189	197	203	203
Fokker 100	—	—	—	1	14
Gates Learjet	32	30	43	56	56
Gulfstream II/III G-1159	15	13	15	14	14
Ilyushin IL-62	52	56	60	66	67
Ilyushin IL-76	36	42	44	55	58
Israel Aircraft 1121/1124	4	8	9	7	3
Lockheed L-1011 Tristar	222	217	230	229	229
Lockheed L-1329 Jetstar	8	7	12	13	13
MBB Hansa HFB-320	—	1	1	1	5
McDonnell Douglas DC-8	302	244	258	282	276
McDonnell Douglas DC-9/MD-80	1,066	1,149	1,218	1,315	1,430
McDonnell Douglas DC-10	357	356	355	361	370
Mitsubishi MU-300 Diamond	—	—	—	1	2
Rockwell/Sabreliner 60	1	—	—	—	3
Tupolev Tu-134	95	98	98	101	97
Tupolev Tu-154	45	57	74	87	95
Yakolev Yak-40/42	50	58	42	52	53
Turboprops—TOTAL	3,350	3,546	3,808	4,219	4,687
Aero Spacelines SuperGuppy	—	—	—	4[7]	4
Aerospatiale N.262/Mohawk 298	31	28	28	25	23
Aerospatiale/Aeritalia ATR 42	—	10	36	76	122
Airtech CN-235	—	—	—	2	8
Antonov An-12	9	11	14	14	15
Antonov An-24/26/30	143	163	200	215	251
B.Ae. ATP	—	—	—	—	12
B.Ae. Vanguard	10	7	8	9	7

(Continued on next page)

TURBINE-ENGINED AIRCRAFT IN THE WORLD AIRLINE FLEET

(By Model, 1985-1989, continued)

	1985	1986	1987	1988	1989
Turboprops (continued)					
B.Ae. Viscount	87	68	47	45	40
B.Ae. (HP-137) Jetstream 31	49	88	114	166	201
B.Ae. (HS) Argosy	7	7	5	5	5
B.Ae. HS-748	156	155	157	154	152
Beech 18 Turbo	12	8	15	21	24
Beech 90 King Air	36	39	36	44	40
Beech 99	174′	179′	169′	171′	173
Beech 100 King Air	9	13	21	24	22
Beech 200 King Air	42	53	62	70	83
Beech 1300	—	—	—	—	5
Beech 1900C	35′	42′	64′	73′	95
Bristol 175 Britannia	8	8	8	7	7
Canadair CL-44	17	16	15	14	15
CASA/Nurtanio C-212 Aviocar	106	105	97	103	112
Cessna 208 Caravan I	3	64	74	150	229
Cessna F406 Caravan II	—	—	—	—	14
Cessna 425/441 Conquest I/II	17	16	16	9	19
Convair 580/600/640	149	146	142	131	132
DHC-2 Turbo Beaver	11	9	3	3	3
DHC-5 Buffalo	2	2	2	2	1
DHC-6 Twin Otter	468	455	450	464	465
DHC-7 Dash 7	89	90	95	100	106
DHC-8 Dash 8	2	21	55	82	120
Dornier DO 128 Turbo-Skyservant	1	—	—	—	—
Dornier DO-228	31	39	59	79	90
Douglas DC-3T Turbo Express	1	1	1	1	—
Embraer EMB-110 Bandeirante	217	207	232	231	222
Embraer EMB-120 Brasilia	—	8	28	64	113
Fokker/Fairchild F-27/FH-227 Friendship	426	434	436	434	432
Fokker 50	—	—	—	13	45
GAF Nomad	23	23	23	16	14
Grumman G-73 Turbo Mallard	6	7	8	11	10
Grumman G-159 Gulfstream I	28	26	31	32	37
Handley Page Herald	22	15	21	15	17
IAI Arava	—	—	—	3	4
Ilyushin IL-18	74	72	71	69	67
Lockheed L-188 Electra	91	76	77	79	83
Lockheed L-100/L-382 Hercules	62	60	56	52	58
Mitsubishi MU-2B	10	10	12	11	5
Nihon AMC YS-11	118	117	108	107	102
Pilatus PC-6 Turbo Porter	30	33	25	—	—
Pilatus Britten-Norman BN-2T Turbo Islander	5	5	5	3	3
Piper PA-31T/42 Cheyenne	16	21	18	28	35
Piper T-1040	7	11	8	9	15

(Continued on next page)

TURBINE-ENGINED AIRCRAFT IN THE WORLD AIRLINE FLEET

(By Model, 1985-1989, continued)

	1985	1986	1987	1988	1989
Turboprops (continued)					
Rockwell Turbo Commander	6	10	9	11	16
Saab SF-340A	16	39	67	105	136
Saunders ST-27	10	10	11	9	2
Shorts SC-5 Belfast	5	5	5	5	5
Shorts SC-7 Skyliner/Skyvan	27	29	15	14	15
Shorts 330	81	76	71	76	68
Shorts 360	66	78	106	130	142
Swearingen Merlin	26	30	52	45	46
Swearingen Metro	263	291	302	356	361
Transall C-160	9	9	8	8	8
Xian (Antonov) Y-7	1	1	10	20	31
Turbine-Powered Helicopters—TOTAL	246	265	303	271	240
Aerospatiale SA-315 Lama	5	3	3	3	—
Aerospatiale SA-316 Alouette III	12	12	11	9	8
Aerospatiale SA-318 Alouette II	1	1	4	4	4
Aerospatiale SA-319 Alouette III Astazou	2	2	4	4	4
Aerospatiale (Nurtanio) SA-330 Puma	19	18	23	23	22
Aerospatiale AS-332 Super Puma	5	5	5	5	5
Aerospatiale AS-335	—	1	—	—	—
Aerospatiale AS-350 Ecureuil/ AStar	5	5	5	6	7
Aerospatiale AS-355 Ecureuil 2/ Twinstar	2	2	2	2	3
Aerospatiale SA-365 Dauphin II	8	9	9	9	12
Bell (Agusta/Fuji) 204	10	8	6	6	5
Bell 205	6	6	2	2	2
Bell 206 Jetranger/Longranger	46	52	53	52	39
Bell 212	15r	27	27	29	27
Bell (Fuji) 214/214ST	7	6	5	1	—
Bell 222 UT	4	5	5	4	1
Bell 412	4	5	5	5	2
Boeing-Vertol 234 Chinook	4	4	3	3	—
Hughes (Kawasaki) 500	15	13	10	1	1
MBB/Kawasaki BK 117	—	1	1	1	1
MBB/Nurtanio Bo.105	7	9	34	34	34
Sikorsky S-55T	3	3	5	5	5
Sikorsky S-58T	12	11	13	7	5
Sikorsky S-61	36	37	41	34	32
Sikorsky S-76	15	20	27	19	18
Westland 30	3	—	—	3	3

Source: Exxon International Company, "Air World Survey," compiled by Aviation Data Service, Inc. (Annually).
NOTE: The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline, and covers aircraft in service as of March 31. Excludes air taxi operators.
r Revised.

U.S. TURBINE-ENGINED AIRCRAFT IN THE WORLD AIRLINE FLEET

Calendar Years 1985-1989

	1985	1986	1987	1988	1989
TOTAL AIRCRAFT IN SERVICE	10,496	10,999	11,711	12,575	13,514
Number Manufactured in U.S.	6,930	7,284	7,699	8,193	8,663
Percent Manufactured in U.S.	66.0%	66.2%	65.7%	65.2%	64.1%
Turbojet Aircraft in Service	6,900	7,188	7,600	8,085	8,587
Number Manufactured in U.S.	5,770	5,971	6,313	6,693	7,029
Percent Manufactured in U.S.	83.6%	83.1%	83.1%	82.8%	81.9%
Turboprop Aircraft in Service	3,350	3,546	3,808	4,219	4,687
Number Manufactured in U.S.	983	1,116	1,184	1,332	1,497
Percent Manufactured in U.S.	29.3%	31.5%	31.1%	31.6%	31.9%
Turbine-Powered Helicopters In Service	246	265	303	271	240
Number Manufactured in U.S.	177	197	202	168	137
Percent Manufactured in U.S.	72.0%	74.3%	66.7%	62.0%	57.1%

Source: Exxon International Company, "Air World Survey," compiled by Aviation Data Service, Inc. (Annually).
NOTE: The "Air World Survey" covers the world's airlines with the exception of Aeroflot, the USSR national airline, and includes aircraft in service as of March 31. Excludes air taxi operators.

JET FUEL COSTS AND CONSUMPTION BY U.S. AIR CARRIERS[a]

Calendar Years 1975-1989

Year	Gallons Consumed (Millions)	Total Cost (Millions)	Cost Per Gallon (Cents)	Cost Index (1972 = 100)	Cost of Fuel as Percent of Cash Operating Expenses
1975	9,495.3	$ 2,777.3	29.2¢	250.8	18.9%
1976	9,820.8	3,116.1	31.7	272.0	19.2
1977	10,282.0	3,729.8	36.3	311.0	20.1
1978	10,627.1	4,178.2	39.3	337.1	19.7
1979	11,278.1	6,503.0	57.7	494.4	24.4
1980	10,874.0	9,769.5	89.8	770.3	29.7
1981	10,087.8	10,498.0	104.1	892.2	29.3
1982[r]	9,942.1	9,755.2	98.1	841.2	27.2
1983[r]	10,214.4	9,073.1	88.8	761.5	24.5
1984[r]	11,050.4	9,361.7	84.7	726.3	23.8
1985[r]	11,675.1	9,326.7	79.9	684.9	22.2
1986[r]	12,643.0	6,995.8	55.3	474.4	16.3
1987[r]	13,577.3	7,593.8	55.9	479.5	16.0
1988[r]	14,156.4	7,557.2	53.4	457.7	14.5
1989	14,095.2	8,472.7	60.1	515.4	14.9

Source: Air Transport Association of America, "Airline Cost Index" (Quarterly).
a Majors and Nationals excluding Air Florida, Capitol, Transamerica, and World.
r Revised from previously reported data for comparability.

U.S. CIVIL AND JOINT-USE AIRCRAFT FACILITIES[a] BY TYPE AND STATE

As of December 31, 1989

State	TOTAL[a]	Public[b]	Paved	Lighted	State	TOTAL[a]	Public[b]	Paved	Lighted
Alabama	195	103	130	99	Nevada	127	60	56	31
Alaska	593	422	61	153	New Hampshire	69	27	40	19
Arizona	270	74	153	68	New Jersey	322	59	135	57
Arkansas	218	96	148	86	New Mexico	170	73	81	53
California	910	274	653	250	New York	493	171	200	133
Colorado	385	85	166	98	N. Carolina	332	122	147	115
Connecticut	130	26	81	28	N. Dakota	480	100	76	98
Delaware	34	11	13	13	Ohio	720	200	278	194
Dist. of Col.	17	2	14	4	Oklahoma	406	158	210	135
Florida	645	130	291	141	Oregon	372	105	152	83
Georgia	363	116	186	112	Pennsylvania	765	156	300	151
Hawaii	53	14	43	13	Rhode Island	23	8	15	7
Idaho	211	121	77	46	S. Carolina	150	73	74	65
Illinois	938	125	262	168	S. Dakota	158	76	60	75
Indiana	554	119	155	122	Tennessee	208	91	126	85
Iowa	273	144	134	146	Texas	1,697	413	847	422
Kansas	385	149	131	134	Utah	111	49	71	44
Kentucky	148	71	93	61	Vermont	61	18	15	11
Louisiana	419	92	233	76	Virginia	322	75	144	85
Maine	148	79	48	33	Washington	412	136	194	136
Maryland	162	40	73	45	W. Virginia	93	40	56	32
Massachusetts	181	52	106	43	Wisconsin	476	148	176	137
Michigan	434	216	181	175	Wyoming	100	43	49	36
Minnesota	475	161	125	139	**50 States-Total**	17,377	5,586	7,568	4,857
Mississippi	207	91	115	80	Puerto Rico	29	11	24	11
Missouri	431	144	199	138	Virgin Islands	8	2	3	2
Montana	214	126	93	85	S. Pacific[c]	32	27	17	11
Nebraska	317	102	102	97	**TOTAL**	17,446	5,626	7,612	4,881

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).

a 17,446 aircraft facilities consists of 12,946 airports (5,302 for public use and 7,644 for private use), 4,016 heliports (109 for public and 3,907 for private use), 70 stolports (7 for public use and 63 for private use), and 414 seaplane bases (208 for public use and 206 for private use). Included in these data are facilities having joint civil-military use.

b "Public" refers to use, whether publicly or privately owned.

c American Samoa, Guam, and Trust Territories.

ACTIVE[a] U.S. AIR CARRIER FLEET

By Type of Aircraft, Number of Engines and Model
Active as of December 1985 - 1989

	1985	1986	1987	1988	1989
TOTAL	4,678	4,909	5,253	5,660	5,778
Turbojets - TOTAL	3,164	3,283	3,575	3,915	3,942
Four-Engine - TOTAL	322	322	382	427	428
Boeing 707	27	35	31	31	27
Boeing 747	151	150	156	171	180
B.Ae. 146	29	25	57	57	53
McDonnell Douglas DC-8	115	112	138	168	168
Three-Engine - TOTAL	1,488	1,466	1,469	1,542	1,459
Boeing 727	1,195	1,172	1,168	1,246	1,167
Lockheed L-1011	114	114	116	112	107
McDonnell Douglas DC-10	179	180	185	184	185
Twin-Engine - TOTAL	1,354	1,495	1,724	1,946	2,055
Airbus A-300	46	52	52	57	63
Airbus A-310	4	7	13	19	19
Airbus A-320	—	—	—	—	11
Boeing 737	476	555	633	706	756
Boeing 757	48	73	95	122	146
Boeing 767	59	69	83	126	111
B.Ae. BAC-111	32	45	39	30	—
Cessna C500 Citation I	2	—	—	—	—
Cessna C550	—	—	—	—	5
Dassault MD-20, Falcon	2	—	—	—	—
Fokker F-28	41	50	47	47	53
Learjet LR-25	—	—	—	1	2
Learjet LR-35	3	1	2	1	1
McDonnell Douglas DC-9/MD-80	641	643	760	837	888
Turboprops - TOTAL	1,073[r]	1,204	1,244[r]	1,375	1,476
Four-Engine - TOTAL	108	96	102	95	95
Canadair CL44D	6	2	6	6	5
De Havilland DHC-7	42	40	41	39	41
Lockheed 188 Electra	38	33	34	30	30
Lockheed 382/L-100 Hercules	22	21	21	20	20
Vickers V745	—	—	—	—	—
Twin-Engine - TOTAL	965[r]	1,108	1,139	1,280	1,380
Beech 65	—	1	4	1	—
Beech 90	3	—[r]	4	1	—
Beech 99	103	95	52	84	53
Beech 100	1	1	—	1	1
Beech 200	1	2	5	7	10
Beech 1900	42	60	48	80	109
British Aerospace Jetstream	46	69	113	135	165

(Continued on next page)

ACTIVE[a] U.S. AIR CARRIER FLEET (Continued)

By Type of Aircraft, Number of Engines and Model
Active as of December 1985 - 1989

	1985	1986	1987	1988	1989
Twin-Engine (continued)					
CASA C212 Aviocar	24	19	16	18	16
Cessna C441	1	3	2	3	4
Convair 580/600/640	100	91	77	72	58
DeHavilland DHC-6	86	68	71	63	69
DeHavilland DHC-8	10	26	34	44	64
Dornier DO228	6	12	18	33	34
Douglas DC-3	1	—	—	—	—
Embraer EMB110/EMB120	79	107	133	139	164
Fairchild/Fokker F-27/FH-227	63	63	47	51[r]	53
Fairchild Swearingen SA-226	113	122	101	90	57
Fairchild Swearingen SA-227	101	135	163	191	212
Grumman G-73	—[r]	—	—	7	5
Grumman G-159	23	15	14	5	6
Grumman G-500	—	—	—	1	—
Mitsubishi MU-2	3	6	1	—	—
Nihon YS-11	42	36	36	22	21
Nord ND-262/STC-262	14	15	12	9	2
Piper PA31T	4	5	6	9	12
Rockwell Aero Commander 690	4	4	1	1	—
Saab-Fairchild SF340A	17	34	51	68	85
Shorts SD-3/SD-330	77	110	110	110	118
Shorts SC-7	1	1	—	—	—
Societe Nationale Industrielle Aerospatiale SNAIS ATR-42	—	8	20	35	62
One-Engine - TOTAL	—	—	3	—	—
Cessna C208	—	—	3	—	—
Piston-Engine - TOTAL	436[r]	420	421	362	353
Four-Engine - TOTAL	38	32	38	36	35
Douglas DC-4	3	1	—	—	—
Douglas DC-6	34	30	37	35	34
Douglas DC-7	1	1	1	1	1
Three-Engine - TOTAL	4	3	3	3	5
Pilatus Britten-Norman BN2A-MK-3 Turbo Islander	4	3	3	3	5
Twin-Engine - TOTAL	394[r]	385	380	323	313
Helicopters - TOTAL	5	2	13	8	7

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).
NOTE: Effective 1978, includes certificated route air carriers, supplemental air carriers (charters), multi-engine aircraft in passenger service of commuters, and all aircraft over 12,500 pounds operated by air taxis, commercial operators, and travel clubs.
a "Active aircraft" must have a current U.S. registration and have flown during the calendar year.
r Revised.

ACTIVE U.S. CIVIL AIRCRAFT[a]

As of December 31, 1963-1988

Year	TOTAL	Air Carrier[b]	General Aviation Aircraft					
			TOTAL	Fixed-Wing Aircraft			Rotorcraft[c]	Other[d]
				Multi-Engine	Single-Engine			
					4-place & over	3-place & over		
1963	87,167	2,079	85,088	9,695	42,647	30,977	1,171	588
1964	90,799[r]	2,057[r]	88,742	10,644	45,777	30,367	1,306	648
1965	97,567	2,125	95,442	11,977	49,789	31,364	1,503	809
1966	106,978	2,272	104,706	13,548	52,972	35,687	1,622	877
1967	116,638	2,452	114,186	14,651	56,865	39,675	1,899	1,096
1968	126,823	2,586	124,237	16,760	60,977	42,830	2,350	1,320
1969	133,496	2,690	130,806	18,111	63,703	45,001	2,557	1,434
1970	134,422	2,679	131,743	18,291	64,759	44,884	2,255	1,554
1971	133,790	2,642	131,148	17,855	64,464	44,792	2,352	1,685
1972	147,593	2,583	145,010	19,849	70,998	49,448	2,787	1,928
1973	156,139	2,599	153,540	21,929	74,831	51,386	3,143	2,251
1974	163,974	2,472	161,502	23,418	78,924	53,008	3,610	2,542
1975	170,970	2,495	168,475	24,559	82,621	54,390	4,073	2,832
1976	180,796	2,492	178,304	25,684	88,211	56,730	4,505	3,174
1977	186,767	2,473	184,294	26,652	91,960	57,340	4,726	3,616
1978	201,323[r]	2,545[r]	198,778	28,782	101,466	59,185	5,315	4,028
1979	213,948	3,609	210,339	31,311	106,028	62,362	5,864	4,770
1980	214,853	3,808	211,045	31,664	107,930	60,505	6,001	4,945
1981	217,199[r]	3,973[r]	213,226	33,301	107,983	59,914	6,974	5,049
1982	213,851	4,072	209,779	34,204[r]	106,503	57,670	6,169	5,233[r]
1983	217,496	4,203	213,293	34,404	107,228	59,199	6,540	5,923
1984	225,313	4,370	220,943	35,649[r]	109,933[r]	61,989	7,096	6,275
1985	215,332	4,678	210,654	33,589[r]	105,555	58,829	6,418	6,263
1986	224,953	4,909	220,044	34,313	109,351	62,427	6,943	7,010
1987	222,436	5,253	217,183	33,032	107,502	63,533	6,333	6,783
1988	215,926	5,660	210,266	32,243	105,207	59,553	6,406	6,857

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).

NOTE: Detail may not add to totals because of estimating procedures.

a "Active aircraft" must have a current U.S. registration and have flown during the calendar year. Prior to 1971, only a current U.S. registration was necessary.

b Effective 1978, includes certificated route air carriers, supplemental air carriers (charters), multi-engine aircraft in commuter passenger service, and all aircraft over 12,500 pounds operated by air taxis, commercial operators, and travel clubs.

c Includes autogiros; excludes air carrier helicopters.

d Includes gliders, dirigibles, and balloons.

r Revised.

ACTIVE U.S. CIVIL AIRCRAFT BY PRIMARY USE AND TYPE OF AIRCRAFT

As of December 31, 1988

Primary Use[a]	TOTAL	Fixed Wing			Rotor-craft[b]	Other[c]
		Turbojet	Turboprop	Piston		
TOTAL—ALL AIRCRAFT ...	215,926	8,102	6,634	187,918	6,414	6,857
Air Carrier—TOTAL	5,660	3,915	1,375	362	8	—
Large	4,439	3,913	438	88	—	—
Small	1,221	2	937	274	8	—
General Aviation—TOTAL ..	210,266	4,187	5,259	187,556	6,406	6,857
Executive	10,882	3,337	3,240	3,270	991	44
Business	34,918	197	648	33,495	468	110
Commuter[d]	973	5	402	451	113	2
Air Taxi[d]	6,518	398	484	4,675	962	—
Instructional	16,647	11	9	15,851	334	468
Personal	122,557	79	129	116,273	935	5,141
Aerial Application	7,042	—	114	6,093	835	—
Aerial Observation	4,759	7	14	3,664	772	302
Other Work	1,841	—	8	1,188	238	407
Other	4,081	153	212	2,574	758	384

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).
NOTE Detail may not add to totals because of estimating procedures.
a Definitions of "primary use" categories available in Glossary of "FAA Statistical Handbook."
b Includes helicopters and autogiros.
c Includes gliders, dirigibles, and balloons.
d Limited to single-engine commuters or Air taxis under 12,500 pounds. Otherwise, aircraft included in "Air Carrier."

U.S. GENERAL AVIATION
ACTIVE AIRCRAFT AND HOURS FLOWN
BY PRIMARY USE

Calendar Years 1984-1988

Primary Use[a]	1984	1985	1986	1987	1988
ACTIVE AIRCRAFT AS OF DECEMBER 31					
TOTAL	220,943	210,654	220,044	217,183	210,266
Executive	16,675	13,610	12,075	11,960	10,882
Business	47,098	45,544	43,780	39,943	34,918
Commuter[b]	1,232	875	1,721	1,014	973
Air Taxi[b]	7,292	6,459	7,568	6,228	6,518
Instructional	15,287	14,410	15,812	15,727	16,674
Rental[c]	9,406	7,919	—	—	—
Personal	105,309	103,053	120,308	123,487	122,557
Aerial Application	7,332	7,286	7,068	6,516	7,042
Aerial Observation	5,173	4,533	4,716	4,858	4,759
Other Work	1,328	1,620	1,274	1,577	1,841
Other	4,777	5,344	5,707	5,873	4,081
THOUSANDS OF HOURS FLOWN					
TOTAL	36,119	34,063	34,416	33,443	33,593
Executive	4,773	4,176	3,781	3,403	3,748
Business	6,635	6,534	5,896	5,713	4,960
Commuter[b]	1,504	674	2,185	1,359	1,118
Air Taxi[b]	3,019	2,719	2,913	2,877	2,842
Instructional	4,553	4,264	4,677	4,904	5,309
Rental[c]	2,855	2,646	—	—	—
Personal	8,418	8,392	10,097	10,787	10,813
Aerial Application	2,008	2,168	1,985	1,666	1,989
Aerial Observation	1,314	1,315	1,620	1,412	1,412
Other Work	312	343	323	379	567
Other	729	831	939	943	835

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation" (Annually).
NOTE: Detail may not add to totals because of rounding and estimating procedures.
a Definitions of "primary use" categories available in Glossary of "FAA Statistical Handbook."
b Limited to single-engine commuters or air taxis under 12,500 pounds.
c Rental is not reported as a separate use category after 1985.

U.S. GENERAL AVIATION
TYPE OF AIRCRAFT AND HOURS FLOWN

Calendar Years 1984-1988

	1984	1985	1986	1987	1988
Number of Active Aircraft by Type					
All Aircraft—TOTAL	220,943	210,654	220,044	217,183	210,266
Fixed Wing: Piston:					
Single Engine: 1-3 Seats	61,989	58,829	62,427	63,533	59,553
4 + Seats	109,933	105,555	109,351	107,502	105,207
Twin Engine: 1-6 Seats	16,539	15,627	16,166	15,741	15,143
7 + Seats	8,719	8,032	7,555	7,566	7,554
Other	262	148	148	112	99
Turboprop:					
Twin Engine: 1-12 Seats	4,992	4,633	4,809	4,337	4,231
13 + Seats	640	607	970	723	826
Other	176	167	185	214	202
Turbojet: Twin Engine	3,780	3,914	4,037	3,900	3,821
Other	540	460	444	438	367
Rotorcraft: Piston	2,936	2,877	2,921	2,813	2,584
Turbine	4,160	3,541	4,022	3,520	3,822
Balloons, Dirigibles, and Gliders	6,275	6,263	7,010	6,783	6,857
Thousands of Hours Flown by Type of Aircraft					
All Aircraft—TOTAL	36,119	34,063	34,416	33,443	33,593
Fixed Wing: Piston	29,194	27,793	26,861	27,039	26,226
Turboprop	2,506	2,080	2,882	2,177	2,370
Turbojet	1,566	1,622	1,654	1,528	1,678
Rotorcraft: Piston	592	564	804	652	576
Turbine	1,903	1,590	1,821	1,631	2,131
Balloons, Dirigibles, and Gliders	358	414	394	416	613
Average Hours Flown per Year per Aircraft by Type					
All Aircraft—TOTAL	158	158	149	148	154
Fixed Wing: Piston:					
Single Engine: 1-3 Seats	139	135	125	134r	132
4 + Seats	137	142	130	126r	134
Twin-Engine: 1-6 Seats	181	174	172	165r	150
7 + Seats	303	274	280	289r	256
Other	433	184	111	140r	225
Turboprop:					
Twin Engine: 1-12 Seats	342	319	335	337	373
13 + Seats	1,112	831	1,013	652	895
Other	339	397r	499	839r	392
Turbojet: Twin Engine	349	375	385	371r	412
Other	393	325	154	229	347
Rotorcraft: Piston	187	192	273	229	228
Turbine	469	460	460r	485	577
Balloons, Dirigibles, and Gliders	57r	67	56	62	95

Source: General Aviation Manufacturers Association, "General Aviation Statistical Databook" (Annually), based on data from the Federal Aviation Administration, "FAA Statistical Handbook of Aviation."

NOTE: Detail may not add to totals because of rounding and/or estimating procedures.

r Revised.

ACTIVE U.S. AIRMAN CERTIFICATES HELD

As of December 31, 1985-1989

	1985	1986	1987	1988	1989
Pilots-TOTAL	709,540	709,118	699,653	694,016	700,010
Students	146,652	150,273	146,016	136,913	142,544
Private	311,086	305,736	300,949	299,786	293,179
Commercial	151,632	147,798	143,645	143,030	144,540
Airline Transport	82,740	87,186	91,287	96,968	102,087
Helicopter (only)	8,123	8,581	8,702	8,608	8,863
Glider (only)[a]	8,168	8,411	7,901	7,600	7,708
Lighter-Than-Air[a]	1,139	1,133	1,153	1,111	1,089
Non-Pilots-TOTAL	395,139	410,079	427,962	448,710[r]	468,405
Mechanics[b]	274,100	284,241	297,178	312,419	326,243
Parachute Rigger[b]	9,395	9,535	9,659	9,770[r]	9,879
Ground Instructor[b]	58,214	59,443	60,861	62,582	64,503
Dispatcher[b]	8,511	9,025	9,491	10,020	10,455
Flight Navigator	1,542	1,512	1,445	1,400	1,357
Flight Engineer	43,377	46,323	49,328	52,519	55,968
Flight Instructor Certificates[c]	58,940	57,355	60,316	61,798	61,472
Instrument Ratings[c]	258,559	262,388	266,122	273,804	282,804

Source: Federal Aviation Administration, "FAA Statistical Handbook of Aviation," (Annually).

a Glider and lighter-than-air pilots are not required to have a medical examination; however, the totals above are the pilots who received a medical.

b No periodic medical examination required; therefore, no determination as to current activity can be made.

c Special ratings shown on pilot certificates represented above, not additional certificates.

r Revised.

HELIPORTS/HELIPADS[a] IN THE UNITED STATES

By State
As of 1989

State	Total Helipads in state	Private Use		Public Use	
		Heliports & Helistops	Helipads at Airports	Heliports & Helistops	Helipads at Airports
Alabama	64	62	0	1	1
Alaska	33	14	3	7	9
Arizona	101	99	0	0	2
Arkansas	65	62	2	0	1
California	384	358	2	1	23
Colorado	170	164	1	1	4
Connecticut	71	67	1	2	1
Delaware	14	13	0	1	0
District of Columbia	22	20	0	0	2
Florida	195	191	0	3	1
Georgia	92	91	0	0	1
Hawaii	22	18	0	1	3
Idaho	25	25	0	0	0
Illinois	230	220	3	6	1
Indiana	95	88	2	4	1
Iowa	49	48	0	0	1
Kansas	28	24	0	0	4
Kentucky	31	30	0	1	0
Louisiana	239	230	2	5	2
Maine	12	11	0	1	0
Maryland	48	46	2	0	0
Massachusetts	97	93	0	2	2
Michigan	61	59	1	1	0
Minnesota	27	24	1	0	2
Mississippi	24	24	0	0	0
Missouri	92	85	1	3	3
Montana	21	19	0	2	0
Nebraska	21	20	1	0	0
Nevada	27	27	0	0	0
New Hampshire	26	24	0	1	1
New Jersey	191	187	0	4	0
New Mexico	20	18	0	2	0

(Continued on next page)

HELIPORTS/HELIPADS[a] IN THE UNITED STATES (Continued)

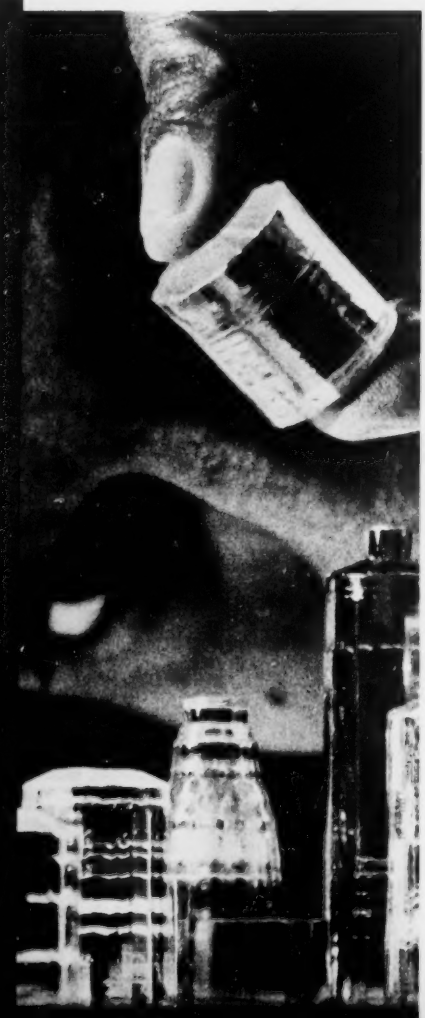
By State
As of 1989

State	Total Helipads in state	Private Use		Public Use	
		Heliports & Helistops	Helipads at Airports	Heliports & Helistops	Helipads at Airports
New York	115	102	0	12	1
North Carolina	48	45	1	2	0
North Dakota	7	7	0	0	0
Ohio	199	173	2	19	5
Oklahoma	86	82	0	4	0
Oregon	79	75	2	2	0
Pennsylvania	267	256	1	10	0
Rhode Island	11	10	0	1	0
South Carolina	21	21	0	0	0
South Dakota	7	7	0	0	0
Tennessee	56	51	1	3	1
Texas	449	432	2	13	2
Utah	34	29	0	0	5
Vermont	13	13	0	0	0
Virginia	96	92	0	1	3
Washington	98	92	2	0	4
West Virginia	22	22	0	0	0
Wisconsin	64	64	0	0	0
Wyoming	14	13	0	0	1
Total U.S.	4,283	4,047	33	116	87

Source: Helicopter Association International, "1990 Helicopter Annual" (Annually).
NOTE: 95.3 percent of all U.S. helicopter landing areas are private, while 4.7 percent are public.
a Excludes temporary heliports, offshore heliports, or infrequently used helicopter landing sites.

90-91

With significant increases in both federal and industry funding, the aerospace industry will in 1990 once again top the ranks of industrial research and development performers. Aerospace will conduct R&D estimated at $24.3 billion, according to a survey by Battelle Memorial Institute.



Incorporating data from National Science Foundation and McGraw-Hill Company surveys, Battelle estimated total expenditures for all U.S. industrial R&D at $100.1 billion, up from $92.6 billion in 1989. Federal funding is estimated at $33.9 billion, up from $30.8 billion in 1989. Industry funding will amount to $66.2 billion, sharply up from the previous estimate of $61.9 billion.

Aerospace is a major contributor to the gain in industrial funding. The aerospace industry will fund R&D valued at $6.9 billion in 1990, almost double its estimate for 1989. At $17.4 billion, federal funding for aerospace R&D will represent a substantial increase over 1989 of $1.8 billion.

The Battelle projection listed the electrical machinery and communications group in second place behind aerospace with estimated total outlays of $16.2 billion. Next, in order, are machinery ($15 billion), automotive ($10.9 billion) and chemicals ($10.8 billion).

Total federal funding for government R&D programs in FY 1990 was estimated at $62.1 billion, up from $59.9 billion in the previous year. The estimate for FY 1991 is $65.6 billion.

As usual, the Department of Defense is by far the largest conductor of government-funded R&D, according to budget estimates. In Fiscal

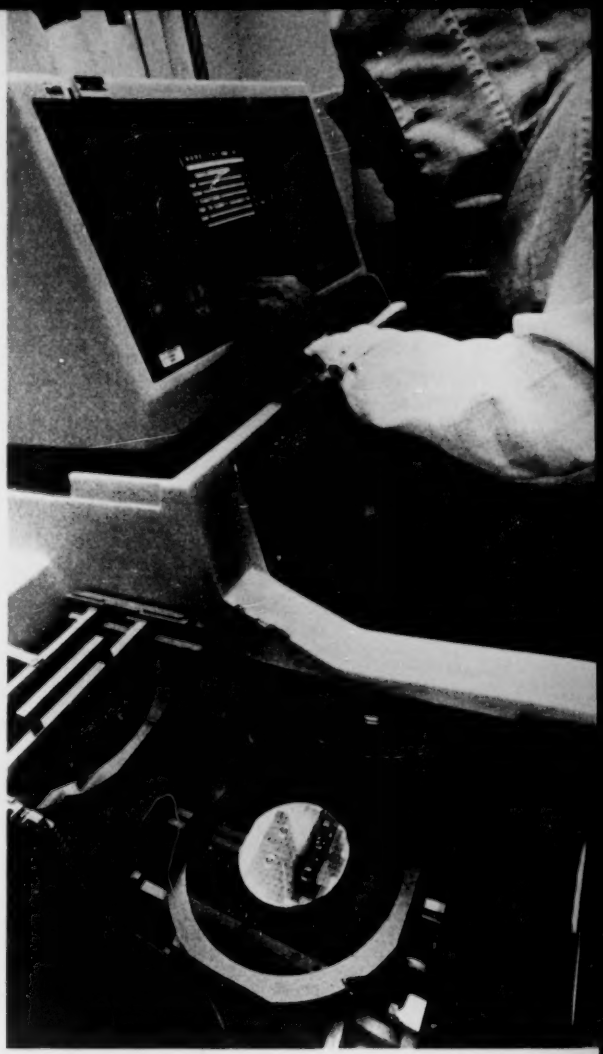
Year 1990, federal outlays by DoD amounted to $37.1 billion, down slightly from $37.3 billion in the previous year. The Office of Management and Budget (OMB) estimated a moderate increase for FY 1991 to $37.5 billion.

NASA outlays in FY 1990 came to $5.8 billion, up substantially from $4.7 billion in the previous year. OMB estimated approximately the same level for FY 1991. Department of Energy outlays for FY 1990 amounted to $5.6 billion (up from $5.3 billion) and OMB estimated $6 billion for FY 1991. All other agencies combined had outlays of $13.6 billion in FY 1990.

Within the Department of Defense, the Air Force continues to lead the other services in appropriations for Research, Development, Test and Evaluation (RDT&E). For FY 1990, the USAF appropriation was $13.5 billion (down from $14.7 billion in 1989) and the estimate for FY 1991 is $13.3 billion. The Navy figures are $9.5 billion (up from $9.3 billion) and $9.1 billion in FY 1991. Army appropriations for RDT&E were $5.4 billion in FY 1990 (up from $5.2 billion) and the estimate for FY 1991 is $6 billion.

The Pacific region, perennial leader, once again topped a geographical breakdown of prime contract awards for defense RDT&E. The Pacific area received FY 1989 contracts worth $7 billion, or 31.6 percent of DoD total awards of $22 billion.

The ranking and dollar value of contracts won by other regions was: Mountain region, $2.9 billion, 13.2 percent; South Atlantic, $2.7 billion, 12.5 percent; Middle Atlantic, $2.3 billion, 10.5 percent; New England, $2.2 billion, 10 percent; East North Central, $1.8 billion, 8.1 percent; West South Central, $1.4 billion, 6.4 percent; West North Central, $1.1 billion, 4.8 percent; and East South Central, $610 million, 2.8 percent.



FUNDS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT ALL INDUSTRIES AND THE AEROSPACE INDUSTRY

By Funding Source Calendar Years 1974-1988
(Millions of Dollars)

Year	All Industries[a]			Aerospace Industry[b]		
	Total	Federal Funds	Company Funds[c]	Total	Federal Funds	Company Funds[c]
CURRENT DOLLARS						
1974	$22,887	$ 8,220	$14,667	$ 5,278	$ 4,000	$1,278
1975	24,187	8,605	15,582	5,713	4,428	1,285
1976	26,997	9,561	17,436	6,339	4,921	1,418
1977	29,825	10,485	19,340	7,033	5,486	1,547
1978	33,304	11,189	22,115	7,536	5,713	1,823
1979	38,226	12,518	25,708	8,041	5,840	2,201
1980	44,505	14,029	30,476	9,198	6,628	2,570
1981	51,810	16,382	35,428	11,968	8,528	3,440
1982[r]	58,650	18,545	40,105	14,451	10,265	4,186
1983[r]	65,268	20,680	44,588	15,406	11,396	4,010
1984[r]	74,800	23,396	51,404	18,858	14,094	4,764
1985[r]	84,239	27,196	57,043	22,231	16,582	5,649
1986[r]	88,179	28,247	59,932	21,050	14,984	6,066
1987[r]	94,117	31,311	62,806	24,488	18,519	5,969
1988	99,422	32,959	66,463	25,667	19,815	5,852
CONSTANT DOLLARS (1982 = 100)[d]						
1974	$42,415	$15,234	$27,181	$ 9,781	$ 7,413	$2,368
1975	40,781	14,509	26,272	9,632	7,466	2,167
1976	42,805	15,159	27,645	10,051	7,802	2,248
1977	44,330	15,584	28,746	10,453	8,154	2,299
1978	46,115	15,493	30,622	10,435	7,911	2,524
1979	48,652	15,932	32,720	10,234	7,433	2,801
1980	51,919	16,366	35,553	10,730	7,732	2,998
1981	55,140	17,435	37,705	12,737	9,076	3,661
1982[r]	58,650	18,545	40,105	14,451	10,265	4,186
1983[r]	62,842	19,911	42,931	14,833	10,972	3,861
1984[r]	69,433	21,717	47,716	17,505	13,083	4,422
1985[r]	75,925	24,512	51,413	20,037	14,945	5,091
1986[r]	77,472	24,817	52,655	18,494	13,165	5,329
1987[r]	80,147	26,664	53,484	20,853	15,770	5,083
1988	81,943	27,165	54,779	21,155	16,331	4,823

Source: National Science Foundation, "Annual Survey of Industrial Research and Development" (Annually).
NOTE: Detail may not add to totals because of rounding.

a Includes all manufacturing industries, plus those non-manufacturing industries known to conduct or finance research and development.

b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, and parts.

c Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other non-profit organizations.

d Based on GNP implicit price deflator.

r Revised.

TOTAL U.S. FUNDS FOR RESEARCH AND DEVELOPMENT BY SOURCE AND PERFORMER[a]

Calendar Years 1986-1989
(Millions of Current Dollars)

Source of Funds	Performer					
	Total All Performers	Federal Government	Industry	Colleges & Universities	Federally-Funded Research & Development Centers	Non-Profit Institutions
1986						
All Sources—TOTAL	$119,863	$13,535	$ 88,179	$10,904	$3,895	$3,350
Federal Government	54,629	13,535	28,247	6,702	3,895	2,250
Industry	61,074	—	59,932	717	—	425
Colleges & Universities	2,772	—	—	2,772	—	—
Nonprofit Institutions	1,388	—	—	713	—	675
1987						
All Sources—TOTAL	$127,316	$13,413	$ 94,117	$12,080	$4,206	$3,500
Federal Government	58,508	13,413	31,311	7,328	4,206	2,250
Industry	64,088	—	62,806	807	—	475
Colleges & Universities	3,135	—	—	3,135	—	—
Nonprofit Institutions	1,585	—	—	810	—	775
1988[b]						
All Sources—TOTAL	$135,231	$14,281	$ 99,422	$13,422	$4,531	$3,575
Federal Government	62,136	14,281	32,959	8,165	4,531	2,200
Industry	67,855	—	66,463	892	—	500
Colleges & Universities	3,437	—	—	3,437	—	—
Nonprofit Institutions	1,803	—	—	928	—	875
1989[c]						
All Sources—TOTAL	$142,000	$15,800	$103,000	$14,450	$4,850	$3,900
Federal Government	65,850	15,800	34,200	8,600	4,850	2,400
Industry	70,350	—	68,800	1,000	—	550
Colleges & Universities	3,850	—	—	3,850	—	—
Nonprofit Institutions	1,950	—	—	1,000	—	950

Source: National Science Foundation, "Annual Survey of Industrial Research and Development" (Annually).
a Source performer detail not available by industry.
b Preliminary.
c Estimate.

ESTIMATED SOURCES OF FUNDS FOR R&D BY BROAD INDUSTRIAL CLASSES, 1990[a]

(Millions of Current Dollars)

	Federal Funds	Industry Funds	Total Funds	% Federal
Aerospace	$17,388	$ 6,876	$ 24,264	71.66%
Electrical Machinery and Communications	6,091	10,100	16,191	37.62
Machinery	1,894	13,066	14,960	12.66
Chemicals	221	10,542	10,763	2.06
Autos, Trucks and Parts, & Other Transportation Equipment	1,505	9,350	10,855	13.86
Professional & Scientific Instruments	661	3,580	4,241	15.59
Petroleum Products	19	1,859	1,878	1.01
Rubber Products	330	1,102	1,432	23.08
Food and Beverage	—	1,523	1,523	—
Paper and Pulp	—	684	684	—
Fabricated Metals	121	1,101	1,222	9.91
Stone, Clay, and Glass	50	1,090	1,140	4.39
Nonferrous Metals	20	329	349	5.66
Iron & Steel	—	620	620	—
Textiles	—	259	259	—
Other Manufacturing	15	960	975	1.54
Total Manufacturing	$28,316	$63,040	$ 91,356	31.00
Non-manufacturing	5,543	3,167	8,710	63.64
TOTAL	33,859	66,207	100,066	33.84

Source: Battelle Memorial Institute, "Probable Levels of R&D Expenditures" (Annually).
a Battelle data, derived from the National Science Foundation and McGraw-Hill surveys.

RESEARCH AND DEVELOPMENT FUNDS AS PERCENT OF NET SALES ALL MANUFACTURING INDUSTRIES AND THE AEROSPACE INDUSTRY

Calendar Years 1978-1988

Year	All Manufacturing Industries[a]		Aerospace Industry[b]	
	Total R&D Funds as Percent of Net Sales	Company R&D Funds as Percent of Net Sales	Total R&D Funds as Percent of Net Sales	Company R&D Funds as Percent of Net Sales
1978	2.9%	2.0%	13.3%	3.2%
1979	2.6	1.9	12.9	3.5
1980	3.0	2.1	13.7	3.8
1981	3.1	2.2	16.0	4.6
1982	3.8	2.6	17.1	5.1r
1983	3.9	2.6	15.2	4.1r
1984	3.9	2.6	15.4	4.0r
1985	4.4	3.0	14.9	3.9r
1986	4.7	3.2r	13.4	4.0r
1987r	4.6	3.1	14.7	3.6
1988	4.8	3.2	15.4	3.5

Source: National Science Foundation, "Annual Survey of Industrial Research and Development" (Annually).

a Includes all manufacturing industries known to conduct or finance research and development.

b Companies classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, and parts.

r Revised.

R&D EXPENDITURES BY STATE BY INDUSTRY, 1987

(Millions of Dollars)

	Total, all states	California	Michigan	New York	New Jersey	Massachusetts	Pennsylvania	Illinois	Texas	Ohio	All other states
Total, all industries	$96,305	$19,475	$7,415	$6,559	$6,141	$5,492	$4,630	$4,284	$4,261	$3,569	$34,479
Aircraft & missiles	23,506	8,265	253	NA	233	NA	1,298	NA	1,716	NA	8,595
Electrical equipment	16,920	2,913	130	353	2,295	1,528	825	1,150	1,125	240	6,361
Machinery	11,409[a]	1,711	203	1,966	174	1,754	253	471	387	410	NA
Chemicals & allied products	9,831	545	800	715	1,665	196	1,006	486	117	662	3,639
Motor vehicles	7,265[a]	NA	5,714	NA	NA	—	NA	107	NA	NA	949
Instruments	5,456	1,274	34	1,169	350	506	144	249	44	123	1,563
Petroleum refining	1,899	318	1	81	NA	NA	47	NA	422	NA	310
Food & tobacco products	1,402	95	NA	74	137	7	43	115	7	39	NA
Rubber products	789[a]	NA	30	15	NA	56	30	37	5	476	179
Primary metals	744[a]	14	37	17	59	30	254	32	NA	48	914
Non-manufacturing industries	8,743	1,811	55	443	579	631	446	521	317	240	3,700
All other industries	4,024	188	NA	192	163	159	NA	386	77	334	2,141

Source: National Science Foundation, "Annual Survey of Industrial Research and Development" (Annually).
NA Publication of data would reveal the operations of individual companies.
a Publishing Federal R&D support in these industries is restricted. Figures shown in "Total, all states" are company funds only.

FUNDS FOR INDUSTRIAL RESEARCH AND DEVELOPMENT IN THE AEROSPACE INDUSTRY

By Type of Research and Funding Source
Calendar Years 1963-1985[b]
(Millions of Dollars)

Year	TOTAL AERO-SPACE	Basic Research			Applied Research			Development		
		Total	Federal Funds	Com-pany Funds	Total	Federal Funds	Com-pany Funds	Total	Federal Funds	Com-pany Funds
1963	$ 4,712	$ 59	$ 31	$ 28	$ 735	$ 585	$ 150	$ 3,917	$ 3,634	$ 283
1964	5,078	67	34	34	766	607	159	4,244	3,948	296
1965	5,148	71	41	30	735	563	172	4,342	3,921	421
1966	5,526	69	36	33	773	563	210	4,685	4,162	523
1967	5,669	71	33	38	726	490	236	4,871	4,071	800
1968	5,765	68	26	42	677	426	251	5,021	4,145	876
1969	5,882	65	24	41	597	347	250	5,220	4,216	1,004
1970	5,219	63	20	43	565	352	213	4,591	3,718	873
1971	4,881	54	37	17	461	279	182	4,365	3,583	782
1972	4,950	60	44	16	451	267	184	4,438	3,722	716
1973	5,052	50	21	29	512	308	204	4,491	3,633	858
1974	5,278	51	19	32	609	360	249	4,617	3,735	882
1975	5,713	54	17	37	614	381	233	5,044	4,119	925
1976	6,339	54	21	33	666	365	301	5,619	4,521	1,098
1977[a]	7,033	56	25	31	753	419	334	6,223	5,017	1,206
1979	8,041	86	44	42	880	499	381	7,076	5,314	1,762
1981	11,968	131	60	71	1,484	897	587	10,353	7,738	2,615
1983	13,853	146	NA	NA	3,466	NA	NA	10,241	7,668	2,573
1984	16,033	247	NA	NA	3,067	NA	NA	12,718	9,870	2,848
1985	17,619	304	162	142	3,785	2,776	1,009	13,530	10,483	3,047

Source: National Science Foundation, "Annual Survey of Industrial Research and Development" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Break-outs by Research Type and Funding Source available only for odd-numbered years between 1977 and 1983.
b Data for years 1986-1988 will become available subsequent to publishing deadlines.
NA Not available.

FEDERAL AERONAUTICS RESEARCH AND DEVELOPMENT

Fiscal Years 1971-1989
(Millions of Dollars)

Year	TOTAL	NASA[a]	DOD[b]	DOT[c]
BUDGET AUTHORITY				
1971	$1,990	$210	$1,707	$ 73
1972	2,295	236	1,964	95
1973	2,187	313	1,799	75
1974	2,030	278	1,678	74
1975	2,015	314	1,627	74
1976	2,351	325	1,941	85
Tr.Qtr.	584	83	480	22
1977	2,727	378	2,256	93
1978	3,338	437	2,807	94
1979	2,850	519	2,240	91
1980	2,991	560	2,336	95
1981	3,286	526	2,653	106
1982	3,581	516	2,984	81
1983	3,871	547	3,221	103
1984	4,087	600	3,224	263
1985	4,355	648	3,422	265
1986	6,660	601	4,927	1,132
1987	5,824	698	4,179	946
1988[E]	7,207	723	5,223	1,262
1989[E]	7,690	872	5,063	1,755
OUTLAYS				
1982[d]	$3,309	$563	$2,657	$ 89
1983	3,554	563	2,920	71
1984	3,727	586	2,995	146
1985	4,010	643	3,101	266
1986	6,071	648	4,373	1,050
1987	5,866	622	4,182	1,062
1988[E]	6,507	679	4,656	1,173
1989[E]	6,965	830	4,896	1,239

Source: NASA, "Aeronautics and Space Report of the President" (Annually).
a Research and Development, Construction of Facilities, Research and Program Management.
b Research, Development, Test, and Evaluation of aircraft and related equipment.
c Federal Aviation Administration: Research, Engineering, and Development; and Facilities, Engineering, and Development.
d First year outlays data available.
E Estimate. Latest year reflects Administration's budget proposal.
Tr.Qtr. See Glossary.

FEDERAL OUTLAYS FOR CONDUCT OF RESEARCH AND DEVELOPMENT

Fiscal Years 1977-1991
(Millions of Dollars)

Year	TOTAL	DOD	NASA	Energy[a]	Other
CURRENT DOLLARS					
1977	$22,462	$10,176	$3,763	$3,181	$ 5,342
1978	24,532	10,726	3,833	3,925	6,048
1979	26,578	11,454	4,064	4,413	6,648
1980	30,351	13,451	4,711	4,698	7,492
1981	34,252	15,720	5,279	5,121	8,132
1982	34,509	18,201	3,220	4,974	8,114
1983	36,560	21,057	2,538	4,771	8,193
1984	40,518	23,583	3,539	4,702	8,694
1985	45,244	27,878	2,970	4,900	9,496
1986	51,576	33,292	3,432	4,705	10,147
1987	52,862	34,581	3,250	4,682	10,349
1988	56,018	35,417	3,832	4,989	11,780
1989[E]	61,172	37,819	4,975	5,887	12,491
1990[E]	62,085	37,064	5,773	5,599	13,649
1991[E]	65,632	37,547	5,747	6,019	16,319
CONSTANT DOLLARS (1982 = 100)[b]					
1977	$33,510	$15,181	$5,614	$4,746	$ 7,970
1978	34,205	14,955	5,344	5,473	8,433
1979	34,118	14,703	5,217	5,665	8,534
1980	35,817	15,873	5,559	5,544	8,841
1981[r]	36,747	16,865	5,664	5,494	8,724
1982	34,509	18,201	3,220	4,974	8,114
1983	35,076	20,202	2,435	4,577	7,861
1984	37,451	21,798	3,271	4,346	8,036
1985[r]	40,567	24,996	2,663	4,393	8,514
1986[r]	45,041	29,073	2,997	4,109	8,861
1987[r]	44,787	29,298	2,754	3,967	8,768
1988[r]	46,060	29,121	3,151	4,102	9,686
1989[E]	47,260	29,435	3,741	4,149	9,935
1990[E]	47,070	28,100	4,377	4,245	10,348
1991[E]	47,729	27,305	4,179	4,377	11,868

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Energy research and development programs transferred from AEC to ERDA with 1974 reorganization and to Dept. of Energy in 1977.
b Based on Fiscal Year GNP implicit price deflator.
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Fiscal Years 1989-1991
(Millions of Dollars)

	1989	1990[E]	1991[E]
TOTAL—APPROPRIATIONS FOR RDT&E	$37,506	$36,718	$38,093
BY APPROPRIATION			
Army	$ 5,154	$ 5,419	$ 6,026
Navy	9,282	9,466	9,102
Air Force	14,668	13,497	13,276
Defense Agencies	8,182	8,145	9,249
Director of Test & Evaluation, Defense	149	178	348
Director of Operational Test & Evaluation, Defense	71	13	91
BY RESEARCH CATEGORIES			
Research	$ 951	$ 923	$ 978
Exploratory Development	2,541	2,403	2,458
Advanced Development	10,376	10,340	11,107
Engineering Development	11,413	11,302	10,942
Management and Support	2,808	2,530	2,849
Operational Systems Development	9,417	9,219	9,760
RECAP OF BUDGET ACTIVITIES			
Technology Base	$ 3,506	$ 3,327	$ 3,436
Advanced Technology Development	5,837	5,858	6,317
Strategic Programs	6,428	5,364	5,609
Tactical Programs	12,989	13,446	13,481
Intelligence and Communications	4,512	4,779	4,957
Defensewide Mission Support	4,234	3,944	4,294
RECAP OF FYDP PROGRAMS			
Strategic Forces	$ 657	$ 598	$ 644
General Purpose Forces	1,930	1,975	2,152
Intelligence and Communications	6,192	6,222	6,533
Airlift/Sealift	14	15	13
Guard and Reserve	79	20	—
Research and Development (FYDP Program 6)	28,089	27,499	28,333
Central Supply and Maintenance	203	218	200
Administration and Associated Activities	—	4	4
Support of Other Nations	4	5	6
Special Operations Forces	337	162	207

Source: Department of Defense Budget, "R,D,T&E Programs (R-1)" (Annually).
NOTE Detail may not add to totals because of rounding.
E Estimate. Latest year reflects Administration's budget proposal.

DEPARTMENT OF DEFENSE
OUTLAYS FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Fiscal Years 1972-1991
(Millions of Dollars)

Year	TOTAL, All RDT&E Functions	Air Force	Navy	Army	Other
1972	$ 7,881	$ 3,205	$2,427	$1,779	$ 470
1973	8,157	3,362	2,404	1,912	479
1974	8,582	3,240	2,623	2,190	529
1975	8,866	3,308	3,021	1,964	573
1976	8,923	3,338	3,215	1,842	528
Tr.Qtr.	2,203	830	778	437	161
1977	9,795	3,618	3,481	2,069	627
1978	10,508	3,626	3,825	2,342	715
1979	11,152	4,080	3,826	2,409	837
1980	13,127	5,017	4,382	2,707	1,021
1981	15,278	6,341	4,783	2,958	1,196
1982	17,729	7,794	5,240	3,230	1,465
1983	20,554	9,182	5,854	3,658	1,861
1984	23,117	10,353	6,662	3,812	2,289
1985	27,103	11,573	8,054	3,950	3,527[r]
1986	32,283	13,417	9,667	3,984	5,215
1987	33,596	13,347	9,176	4,721	6,352
1988	34,792	14,302	8,828	4,624	7,038
1989	37,002	14,912	9,291	4,966	7,833
1990[E]	36,527	13,900	9,273	5,234	8,121
1991[E]	36,970	13,276	9,256	5,632	8,806

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually).
E Estimate. Latest year reflects Administration's budget proposal.
r Revised.
Tr.Qtr. See Glossary.

DEPARTMENT OF DEFENSE
PRIME CONTRACT AWARDS
FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Fiscal Years 1985-1989
(Millions of Dollars)

Program Categories	1985	1986	1987	1988	1989
TOTAL—RDT&E	$18,938	$19,812	$21,809	$22,543	$23,206
Research	1,142	1,664	1,730	1,444	1,429
Exploratory Development	1,716	1,494	1,524	1,623	1,581
Other Development	15,432	15,870	17,964	18,937	18,966
Management & Support	648	784	592	538	1,230
Aircraft—TOTAL	$ 2,304	$ 3,160	$ 3,561	$ 5,055	$ 4,689
Research	130	591	437	139	11
Exploratory Development	139	106	103	125	85
Other Development	2,025	2,449	3,007	4,777	4,563
Management & Support	9	14	14	14	30
Missile and Space Systems—TOTAL	7,119	6,873	7,943	7,800	6,962
Research	23	22	64	106	260
Exploratory Development	385	325	356	340	331
Other Development	6,583	6,401	7,401	7,218	6,277
Management & Support	127	125	122	135	95
Electronics & Communications Equipment—TOTAL	4,718	4,515	4,637	3,854	3,744
Research	126	122	162	137	182
Exploratory Development	394	325	280	251	289
Other Development	4,083	3,983	4,117	3,417	3,190
Management & Support	115	86	79	49	83
All Other—TOTAL[a]	4,797	5,264	5,668	5,834	7,811
Research	863	930	1,067	1,062	976
Exploratory Development	798	738	785	907	876
Other Development	2,741	3,037	3,439	3,525	4,936
Management & Support	397	559	377	340	1,022

Source: Department of Defense, "Prime Contract Awards by Service Category and Federal Supply Classification" (Annually).
NOTE: Detail may not add to totals because of rounding.
a "All Other" includes ships, tank-automotive, weapons, ammunition, services, and other.

DEPARTMENT OF DEFENSE
NET VALUE OF PRIME CONTRACT AWARDS OVER $25,000[a]
FOR RESEARCH, DEVELOPMENT, TEST, & EVALUATION

By Region and Type of Contractor
Fiscal Year 1989

REGION	TOTAL	Type of Contractor		
		Educational Institutions	Other Non-Profit Institutions[a]	Business Firms
TOTAL—Millions of Dollars ...	$21,966	$1,074	$1,508	$19,384
New England	$ 2,191	$ 423	$ 459	$ 1,309
Middle Atlantic	2,317	154	40	2,123
East North Central	1,780	74	98	1,608
West North Central	1,064	36	3	1,025
South Atlantic	2,735	113	457	2,166
East South Central	610	17	4	589
West South Central	1,416	31	28	1,357
Mountain	2,901	75	11	2,815
Pacific[b]	6,950	150	409	6,392
PERCENT OF TOTAL	100.0%	100.0%	100.0%	100.0%
New England	10.0%	39.4%	30.4%	6.8%
Middle Atlantic	10.5	14.4	2.7	11.0
East North Central	8.1	6.9	6.5	8.3
West North Central	4.8	3.3	0.2	5.3
South Atlantic	12.5	10.5	30.3	11.2
East South Central	2.8	1.6	0.3	3.0
West South Central	6.4	2.9	1.8	7.0
Mountain	13.2	7.0	0.7	14.5
Pacific[b]	31.6	14.0	27.1	33.0

Source: Department of Defense, "Prime Contract Awards by Region and State" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Includes contracts with other government agencies.
b Includes Alaska and Hawaii.

MISSILE PROGRAMS
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION[a]

By Agency, Type, and Model
Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Agency, Type, and Model	1989	1990[E]	1991[E]
AIR FORCE			
ACM	$ 97.0	$ 43.0	$ 52.3
HAVE NAP	27.8	—	—
Peacekeeper (M-X)	458.7	774.2	548.0
SRAM II	190.9	215.6	156.9
NAVY			
*AAAM	$ 29.6	$ 70.4	$ 84.2
AMRAAM[b]	12.5	7.0	3.7
HARM[b]	10.8	16.6	10.4
Harpoon	26.0	3.0	—
Hawk	5.0	9.3	6.7
Penguin	8.0	5.8	—
RAM	7.3	5.1	3.0
Standard	54.6	55.5	44.7
Tomahawk	56.6	18.1	15.4
Trident II	567.2	213.9	91.8
VLA	29.5	2.0	30.0
ARMY			
Advanced Anti-Tank Weapon System	$106.2	$ 137.9	$ 76.8
ATACMS	73.6	41.0	—
Laser Hellfire[c]	14.9	28.6	30.5
LOS-F-H	48.5	54.8	—
*NLOS	142.4	122.1	99.1
Patriot	22.6	37.3	23.7
TOW 2[d]	24.6	50.8	42.9

Source: Department of Defense Budget, "Program Acquisition Costs by Weapon System" (Annually).
NOTE: See Missile Programs Chapter for missile program procurement authorization data.
a Total Obligational Authority.
b Navy and Air Force funding.
c Army and Navy funding.
d Army and Marine Corps funding.
E Estimate. Latest year reflects Administration's budget proposal.
* Programs in R&D only.

MILITARY AIRCRAFT PROGRAMS
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION[a]

By Agency, Type, and Model
Fiscal Years 1989, 1990, and 1991
(Millions of Dollars)

Agency, Type, and Model	1989	1990[E]	1991[E]
AIR FORCE			
AC-130U Gunship	$ 85.4	$ 22.4	$ 13.9
*Advanced Tactical Fighter	674.5	1,045.9	1,047.4
*Aircraft Engine Component Improvement Program[b]	132.9	111.6	135.5
B-2 Advanced Tactical Bomber	2,176.5	1,881.4	1,556.7
C-17	905.5	885.2	541.1
F-15E Eagle	84.8	86.4	89.1
F-16 Falcon	23.1	25.0	70.1
KC-135 Re-engining/modern	3.1	2.2	3.6
LANTIRN (Night Precision Attack)	6.4	11.5	7.8
MC-130H Combat Talon	18.2	12.1	29.4
*National Aerospace Plane	228.4	192.5	158.0
T-1A (TTTS)	4.1	3.6	2.4
NAVY			
AH-1W Sea Cobra	$ 11.5	$ 17.7	$ 14.6
AV-8B Harrier	37.0	27.2	30.7
CH/MH-53E Super Stallion	8.4	7.8	19.9
E-2C Hawkeye	22.6	37.8	37.5
E-6A Hermes	3.2	—	—
EA-6B Prowler	—	9.7	1.7
F-14 D Tomcat	152.6	117.8	121.4
V-22 Osprey[b]	301.2	255.0	—
*P-7A LRAACA	64.4	198.9	234.9
SH-60B Seahawk (LAMPS MK-III)	1.9	1.1	21.6
T-45 Training System	91.2	22.4	14.9
ARMY			
AH-64 Attack Helicopter	$ 51.7	$ 66.5	$ 60.5
*LHX Army Helicopter	177.2	274.2	465.1
OH-58D AHIP	—	—	25.8
UAVs[c]	40.3	82.3	79.6
UH-60A Black Hawk[c]	21.9	—	—

Source: Department of Defense Budget, "Program Acquisition Costs by Weapon System" (Annually).
NOTE: See Aircraft Production Chapter for aircraft program procurement authorization data.
a Total Obligational Authority.
b Air Force and Navy funding.
c Army, Navy, and Air Force funding.
E Estimate. Latest year reflects Administration's budget proposal.
* Programs in R&D only.

90-91

In a year in which the United States as a whole experienced a merchandise trade deficit amounting to $109.4 billion, the U.S. aerospace industry once again set new records both for export volume and trade balance. It was the fifth consecutive year that the U.S. aerospace industry posted increases for those categories. The achievement underscored again the importance to the U.S. economy of high value, high technology exports, as the gains of the aerospace industry offset to some degree, the overall U.S. trade imbalance.

By dollar volume, U.S. aerospace exports increased to $32.1 billion in 1989, up $5.2 billion from $26.9 billion the previous year; the total of 1989 represented slightly over 8.8 percent of the dollar value of all U.S. exports.

Aerospace imports, however, were at $10 billion in 1989, an increase of nearly $1 billion from the previous year. Aerospace imports have now increased in each of the last six years.

Nonetheless, the aerospace trade balance reached a new highwater mark—$22.1 billion in 1989, bettering the previous record of $17.9 billion set in 1988 by nearly 24 percent.

Civil products—registering a total dollar volume of $25.6 billion—accounted for nearly 80 percent of total U.S. export volume in 1989. Military products represented $6.5 billion of the $32.1 billion total. The civil product gain of more than $5 billion over the previous year was due largely to a surge of deliveries of commercial transport aircraft, whose dollar volume—$12.3 billion—represented nearly one-half of civil aerospace exports.

A breakdown of civil exports shows sales of complete aircraft at $13.4 billion (up from $10.3 billion in 1988); aircraft and engine parts at $10 billion (up from $8.4 billion); and aircraft engines at $1.9 billion (up from $1.6 billion).

More than twice the number of general aviation aircraft (1,597) were shipped in 1989 compared with 643 units the previous year. This continued the surge in growth of the past five years in this export category. The combined dollar value of general aviation shipments in 1989 was $419 million; in 1988, the comparable figure was $348 million.

Civil helicopter exports increased slightly to 294 units last year compared with 280 shipments in 1988, but the dollar value fell to $156 million from $219 million the previous year.

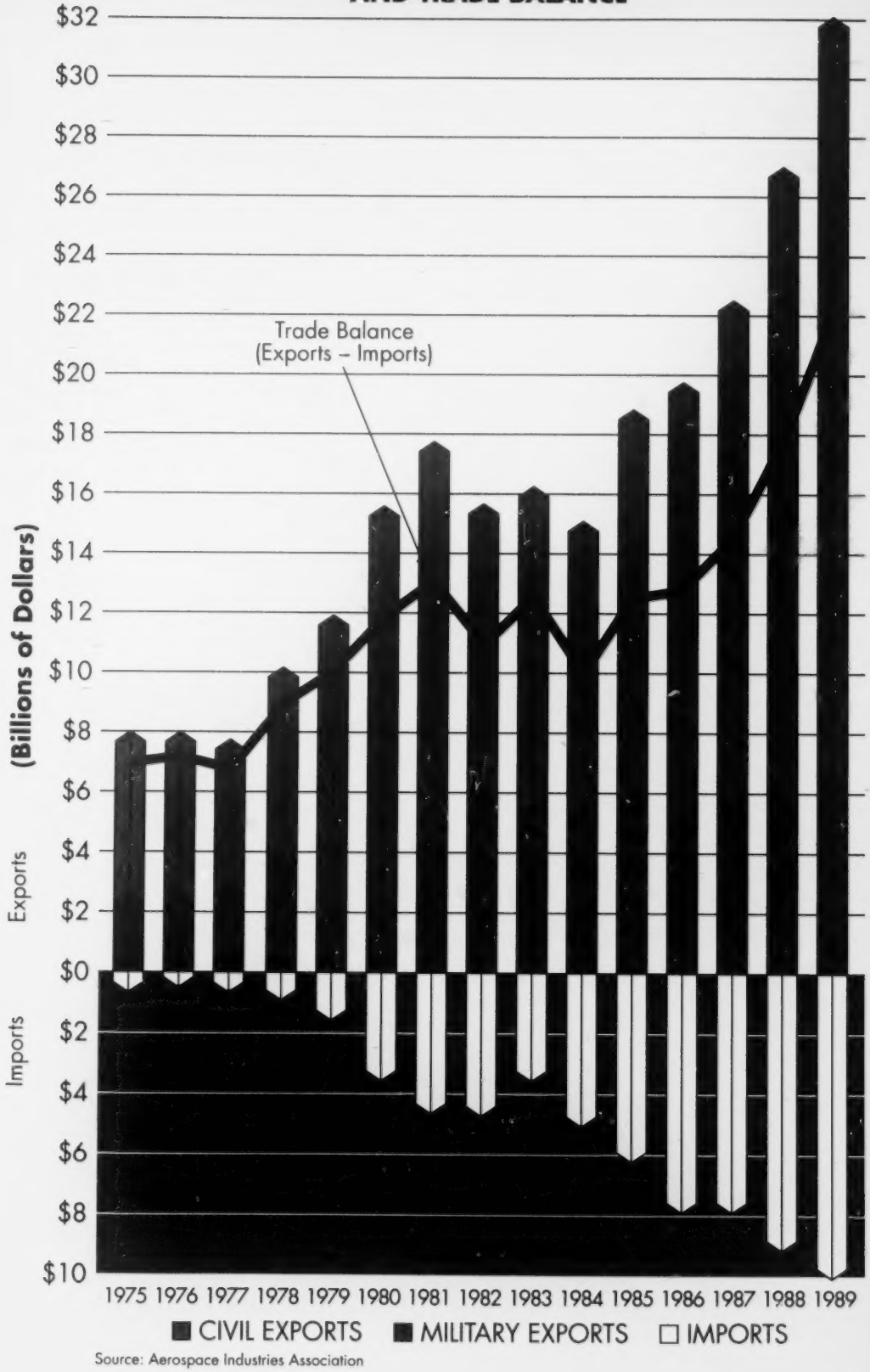
Military exports declined slightly in 1989 to $6.5 billion, compared with $6.7 billion in 1988. The nominal decrease belied the sharp drop in the export sales of complete aircraft, which went from $2.2 billion in 1988 to $1.1 billion in 1989. Sales of aircraft and engine parts, however, increased to $4.1 billion in 1989, up from $3.2 billion the previous year. Missiles, rockets and parts exports remained fairly static in 1989 at $1 billion, compared with $1.1 billion in 1988. The story was much the same for export sales of military aircraft engines where the numbers for 1989 and 1988 were $236 million and $223 million, respectively.

Civil products, at $7.2 billion, accounted for 72 percent of U.S. aerospace imports. The breakdown: aircraft and engine parts, $3.4 billion (down from $4 billion); complete aircraft, $2.8 billion (up slightly from $2.7 billion); aircraft engines, $1 billion (up from $951 million). Military imports showed a significant rise to $2.8 billion from $1.5 billion in 1988. The increase came primarily in the category of aircraft engines ($1.0 billion, up from $0.1 billion).

The principal customers for U.S. aerospace exports were the United Kingdom, which bought products worth $3.5 billion (up from $2.9 billion in 1988); West Germany, $3.1 billion (more than double the $1.4 billion of the previous year); France, $2.8 billion (up from $2.1 billion); Japan, $2.7 billion (virtually the same as the previous year); Canada, $2.1 billion (up from $1.8 billion); and the Netherlands, $1.4 billion (almost double the $744 million of the previous year).

France continued to lead the list of countries of origin for U.S. aerospace imports with $3.3 billion in sales, compared with $2.9 billion in 1988. The United Kingdom was second at $2.1 billion in sales to the United States (up from $1.7 billion in 1988) and Canada was third at $1.9 billion (down from $2 billion).

AEROSPACE EXPORTS, IMPORTS, AND TRADE BALANCE



Source: Aerospace Industries Association

U.S. TOTAL AND AEROSPACE FOREIGN TRADE[a]

Calendar Years 1964-1989
(Millions of Dollars)

Year	Total U.S. Merchandise Trade[b]			Aerospace		
	Trade Balance	Exports	Imports	Trade Balance	Exports	Imports
1964	$ 7,006	$ 25,690	$ 18,684	$ 1,518	$ 1,608	$ 90
1965	5,334	26,699	21,366	1,459	1,618	159
1966	3,837	29,379	25,542	1,370	1,673	303
1967	4,122	30,934	26,812	1,961	2,248	287
1968	837	34,063	33,226	2,661	2,994	333
1969	1,289	37,332	36,043	2,831	3,138	307
1970	3,225	43,176	39,952	3,097	3,405	308
1971	(1,476)[c]	44,087	45,563	3,830	4,203	373
1972	(5,729)	49,854	55,583	3,230	3,795	565
1973	2,390	71,865	69,476	4,360	5,142	782
1974	(3,884)	99,437	103,321	6,350	7,095	745
1975	9,551	108,856	99,305	7,045	7,792	747
1976	(7,820)	116,794	124,614	7,267	7,843	576
1977	(28,353)	123,182	151,534	6,850	7,581	731
1978	(30,205)	145,847	176,052	9,058	10,001	943
1979	(23,922)	186,363	210,285	10,123	11,747	1,624
1980	(19,696)	225,566	245,262	11,952	15,506	3,554
1981	(22,267)	238,715	260,982	13,134	17,634	4,500
1982	(27,510)	216,442	243,952	11,035	15,603	4,568
1983	(52,409)	205,639	258,048	12,619	16,065	3,446
1984	(106,703)	223,976	330,678	10,082	15,008	4,926
1985	(117,712)	218,815	336,526	12,593[r]	18,725[r]	6,132
1986	(138,279)	227,159	365,438	11,826[r]	19,728[r]	7,902
1987	(152,119)	254,122	406,241	14,575[r]	22,480[r]	7,905
1988	(118,526)	322,426	440,952	17,860	26,947	9,087
1989	(109,399)	363,812	473,211	22,083	32,111	10,028

Source: Bureau of the Census, Foreign Trade Division and Aerospace Industries Association, based on data from International Trade Administration.

NOTE: The Commerce Department began reporting international trade using the Harmonized Tariff Schedules of the United States in 1989. Previous years based on the Tariff Schedules of the United States Annotated.

a Total U.S. and aerospace foreign trade are reported as (1) exports of domestic merchandise, including Department of Defense shipments, and undocumented exports to Canada, f.a.s. (= free alongside ship) basis, (2) imports for consumption, customs value basis.

b Data substituted for discontinued series.

c First U.S. trade deficit since 1888.

r Revised.

U.S. EXPORTS OF AEROSPACE PRODUCTS[a] BY MAJOR COUNTRIES OF DESTINATION

Calendar Years 1985-1989
(Millions of Dollars)

Major Countries of Destination	1985	1986	1987	1988	1989
Australia	$1,034	$1,327	$1,036	$1,208	$1,271
Belgium/Luxembourg	216	345	373	348	538
Brazil	407	451	912	942	813
Canada	964	1,005	1,103	1,804	2,137
China	678	334	528	425	664
France	1,014	1,480	1,382	2,074	2,764
Germany, West	967	1,282	1,274	1,415	3,134
Hong Kong	140	266	351	166	381
Israel	333	304	487	454	453
Italy	725	533	455	578	625
Japan	1,792	2,209	2,313	2,710	2,700
Korea, South	536	301	343	823	1,257
Netherlands	217	625	565	744	1,448
Saudi Arabia	687	670	221	235	266
Singapore	641	529	498	505	1,133
Spain	115	204	447	691	1,104
Sweden	463	419	307	627	815
Taiwan	358	238	153	164	460
United Kingdom	1,566	1,301	2,297	2,908	3,520

Source: U.S. Department of Commerce, International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Includes all civil products, free alongside ship basis; excludes military products whose country of destination are not reported.

U.S. IMPORTS OF AEROSPACE PRODUCTS[a] BY MAJOR COUNTRIES OF ORIGIN

Calendar Years 1985-1989
(Millions of Dollars)

Major Countries of Destination	1985	1986	1987	1988	1989
Brazil	$ 34	$ 84	$ 122	$ 183	$ 204
Canada	1,552	1,905	1,821	1,985	1,922
France	1,673	2,007	1,976	2,932	3,290
Germany, West	229	315	347	396	419
Israel	132	211	208	178	187
Italy	138	221	266	339	300
Japan	185	272	319	426	474
Netherlands	219	275	127	141	255
Sweden	183	244	278	246	305
United Kingdom	1,562	1,898	2,004	1,738	2,057

Source: U.S. Department of Commerce, International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Includes civil and military products, c.i.f. (Cost, Insurance, and Freight) basis.

U.S. IMPORTS OF AEROSPACE PRODUCTS

Calendar Years 1985-1989
(Millions of Dollars)

Aerospace Imports	1985	1986	1987	1988	1989
TOTAL	$6,132	$7,902	$7,905	$9,087	$10,028
TOTAL CIVIL	$4,984	$6,398	$6,409	$7,604	$ 7,200
Complete Aircraft—TOTAL	$1,502	$2,050	$2,038	$2,702	$ 2,788
Transports	599	742	551	1,125	1,282
General Aviation	673	1,053	1,337	1,369	1,160
Helicopters	45	63	79	104	109
Other, Including Used Aircraft, & Gliders, Balloons, & Airships	185	192	70	103	238[a]
Aircraft Engines—TOTAL	1,019	1,133	1,117	951	999
Turbine Engines	1,011	1,114	1,110	951	961[b]
Piston Engines	8	19	7	—	38
Aircraft and Engine Parts—TOTAL	2,463	3,215	3,254	3,951	3,414
Aircraft Parts and Accessories	381	594	659	2,585	2,305[b]
Turbine Engine Parts	851	1,053	1,058	1,323	924[b]
Piston Engine Parts	14	12	19	14	136
Spacecraft, & Other Parts & Accessories[c]	1,217	1,556	1,519	29	50
TOTAL MILITARY	$1,148	$1,504	$1,496	$1,483	$ 2,828
Complete Aircraft—TOTAL	$ 20	$ 35	$ 33	$ 2	$ 17
Aircraft Engines—TOTAL	217	286	199	106	971
Turbine Engines	215	283	196	101	961[b]
Piston Engines Including Parts	2	3	3	5	10
Aircraft and Engine Parts—TOTAL	911	1,183	1,265	1,376	1,841
Aircraft Parts	493	690	699	869	797[b]
Turbine Engine Parts	228	317	370	480	881[b]
Spacecraft, Missiles, Rockets, Other Parts & Accessories[c]	190	176	196	27	162[b]

Source: Aerospace Industries Association, based on data from International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.

a Products within this category are not designated civil or military by the Harmonized Tariff Schedules. Historically, these products have been predominantly civil.

b Category contains products whose use (civil or military) is unspecified by the Harmonized Tariff Schedules. Figures for those products distributed equally between civil and military.

c Includes satellites, propulsion engines, and parachutes.

U.S. IMPORTS OF COMPLETE AIRCRAFT

Calendar Years 1985-1989

Aircraft Imports	1985	1986	1987	1988	1989
TOTAL NUMBER OF AIRCRAFT	1,241	797	816	737	703
Civil Aircraft—TOTAL	1,166	742	630	706	674
New Complete Aircraft:					
Helicopters	60	87	98	114	124
General Aviation:					
Single-Engine	46	71	41	40	59
Multi-Engine Under 4,400 lbs	8	18	1	3	1
Multi-Engine 4,400-10,000 lbs	46	58	81	74	27
Multi-Engine, Turbojet/Turbofan, 10,000-33,000 lbs	54	63	76	74	39
Multi-Engine, Other, Including Turboshaft, 10,000-33,000 lbs	49	87	79	78	87
Transports (Multi-Engine, Over 33,000 lbs)	29	36	22	18	36
Other Civil Aircraft:					
Used or Rebuilt	246	141	115	194	210
Aircraft Previously Exported from U.S.	NA	NA	NA	NA	NA
Gliders	628	181	117	111	76[a]
Balloons & Airships	NA	NA	NA	NA	15[a]
Military Aircraft—TOTAL	75	55	186	31	29[b]
New Complete Aircraft	66	47	123	27	25
Gliders	9	8	63	4	(a)
Balloons & Airships	NA	NA	NA	NA	(a)

(Continued on next page)

U.S. IMPORTS OF COMPLETE AIRCRAFT (Continued)

Aircraft Imports	1985	1986	1987	1988	1989
TOTAL VALUE OF AIRCRAFT (Millions of Dollars)	$1,522.0	$2,084.5	$2,070.4	$2,703.3	$2,804.5
Civil Aircraft—TOTAL	$1,501.6	$2,049.6	$2,037.7	$2,701.5	$2,788.1
New Complete Aircraft:					
Helicopters	44.7	62.6	79.3	103.9	108.7
General Aviation:					
Single-Engine	7.5	8.1	3.1	4.5	85.0
Multi-Engine Under 4,400 lbs	1.5	1.5	0.3	6.5	0.1
Multi-Engine 4,400-10,000 lbs	95.1	134.9	206.7	163.6	88.0
Multi-Engine, Turbojet/Turbofan, 10,000-33,000 lbs	313.1	433.5	677.3	729.1	372.0
Multi-Engine, Other, Including Turboshaft, 10,000-33,000 lbs	255.6	475.5	449.8	465.3	614.9
Transports (Multi-Engine, Over 33,000 lbs)	598.8	741.8	551.1	1,125.4	1,281.8
Other Civil Aircraft:					
Used or Rebuilt	177.2	189.0	60.7	92.0	236.7
Aircraft Previously Exported from U.S.	—	—	8.0	0.1	48.8
Gliders	3.8	1.7	0.6	0.5	0.3[a]
Balloons & Airships	4.4	0.9	0.9	10.8	0.5[a]
Military Aircraft—TOTAL	$ 20.4	$ 34.9	$ 32.7	$ 1.8	$ 16.5[b]
New Complete Aircraft	19.4	34.0	29.8	1.6	16.4
Gliders	0.2	0.8	1.3	0.1	(a)
Balloons & Airships	0.8	0.1	1.6	0.1	(a)

Source: Aerospace Industries Association, based on data from International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Products within this category are not designated civil or military by the Harmonized Tariff Schedules. Historically, these products have been predominantly civil.
b Includes used aircraft.
NA Not available.

TOTAL U.S. EXPORTS AND EXPORTS OF AEROSPACE PRODUCTS

Calendar Years 1964-1989
(Millions of Dollars)

Year	TOTAL Exports[a] of U.S. Merchandise[b]	Exports of Aerospace Products				
		TOTAL	Percent of Total U.S. Exports	Civil		Military
				Total	Trans-ports	
1964	$ 25,690	$ 1,608	6.3%	$ 764	$ 211	$ 844
1965	26,699	1,618	6.1	854	353	764
1966	29,379	1,673	5.7	1,035	421	638
1967	30,934	2,248	7.3	1,380	611	868
1968	34,063	2,994	8.8	2,289	1,200	705
1969	37,332	3,138	8.4	2,027	947	1,111
1970	43,176	3,405	7.9	2,516	1,283	889
1971	44,087	4,203	9.5	3,080	1,567	1,123
1972	49,854	3,795	7.6	2,954	1,119	841
1973	71,865	5,142	7.2	3,788	1,664	1,354
1974	99,437	7,095	7.1	5,273	2,655	1,822
1975	108,856	7,792	7.2	5,324	2,397	2,468
1976	116,794	7,843	6.7	5,677	2,468	2,166
1977	123,182	7,581	6.2	5,049	1,936	2,532
1978	145,847	10,001	6.9	6,018	2,558	3,983
1979	186,363	11,747	6.3	9,772	4,998	1,975
1980	225,566	15,506	6.9	13,248	6,727	2,258
1981	238,715	17,634	7.4	13,312	7,180	4,322
1982	216,442	15,603	7.2	9,608	3,834	5,995
1983	205,639	16,065	7.8	10,595	4,683	5,470
1984	223,976	15,008	6.7	9,659	3,195	5,350
1985	218,815	18,725[r]	8.6	12,942[r]	5,518	5,783[r]
1986	227,159	19,728[r]	8.7[r]	14,851[r]	6,276	4,875[r]
1987	254,122	22,480[r]	8.8[r]	15,768[r]	6,377	6,716[r]
1988	322,426	26,947	8.4	20,298[r]	8,766	6,650[r]
1989	363,812	32,111	8.8	25,619	12,313	6,492

Source: Bureau of the Census, Foreign Trade Division and Aerospace Industries Association, based on data from International Trade Administration.

NOTE: International trade reported using Harmonized Tariff Schedules after 1988.

a Data substituted for discontinued series.

b Includes DOD shipments and undocumented exports to Canada, free alongside ship basis.

r Revised.

U.S. EXPORTS OF AEROSPACE PRODUCTS

Calendar Years 1985-1989
(Millions of Dollars)

Aerospace Exports	1985	1986	1987[r]	1988	1989
TOTAL	$18,725[r]	$19,728[r]	$22,480	$26,947	$32,111
TOTAL CIVIL	$12,942[r]	$14,851[r]	$15,768	$20,298[r]	$25,619
Complete Aircraft—TOTAL	$ 6,694	$ 7,365	$ 7,518	$10,295[r]	$13,447
Transports	5,518	6,276	6,377	8,766	12,313
General Aviation[a]	191	243	295	348	419
Helicopters	210	277	201	219	156
Used aircraft	333	501	503	639	533
Other, Incl. Spacecraft	442	68	141	323	217[b]
Aircraft Engines—TOTAL	923	987	1,207	1,570	1,948
Turbine Engines	880	944	1,154	1,492	1,856
Piston Engines	43	43	53	78	93
Aircraft and Engine Parts Incl. Spares—TOTAL	5,325[r]	6,499[r]	7,043	8,432[r]	10,019
Aircraft Parts & Accessories	3,633[r]	4,412[r]	4,650	5,442[r]	6,258
Aircraft Engine Parts	1,692	2,087	2,393	2,990	3,761
TOTAL MILITARY	$ 5,783[r]	$ 4,875[r]	$ 6,716	$ 6,650[r]	$ 6,492
Complete Aircraft—TOTAL[c]	$ 2,012[r]	$ 1,502[r]	$ 2,628	$ 2,157	$ 1,086
Fighters & Fighter Bombers	1,351[r]	1,016	1,986	1,469	368
Transports	102[r]	156[r]	363	212	234
Helicopters	117	123	81	198	180
Used Aircraft	59	7	4	59	56
Other, Incl. Spacecraft	383	200	194	219	247[b]
Aircraft Engines—TOTAL	146	111	158	223	236
Turbine Engines	144	108	154	213	198
Piston Engines	2	3	4	10	38
Aircraft and Engine Parts Incl. Spares—TOTAL	2,800[r]	2,604[r]	3,085	3,214[r]	4,134
Aircraft Parts & Accessories	2,279[r]	2,129[r]	2,457	2,546[r]	3,450
Aircraft Engine Parts	521	475[r]	628	668	684
Guided Missiles, Rockets, & Parts—TOTAL	825	658[r]	845	1,056	1,037
Guided Missiles & Rockets	404	303	353	383	375
Missile & Rocket Parts	387	322[r]	456	622	656
Missile & Rocket Engines	14	17	21	30	6
Missile & Rocket Engine Parts	20	16	15	21	0

Source: Aerospace Industries Association, based on data from International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a All fixed-wing aircraft under 33,000 pounds.
b Products within this category are not designated civil or military by the Harmonized Tariff Schedules. Historically, aircraft herein have been predominantly civil.
c Includes aircraft exported under Military Assistance Programs and Foreign Military Sales.
r Revised.

U.S. EXPORTS OF CIVIL AIRCRAFT

Calendar Years 1985-1989

Civil Aircraft Exports	1985	1986	1987[r]	1988	1989
TOTAL NUMBER OF AIRCRAFT	1,050	1,327	1,811	2,784	3,851[b]
Helicopters—TOTAL	137	210	242	280	294
Under 2,200 lbs	68	104	115	161	186
Over 2,200 lbs	69	106	127	119	108
General Aviation—TOTAL	484	464	487	643	1,597
Single-Engine	334	270	295	459	1,406
Multi-Engine, Under 4,400 lbs	66	63	51	51	39
Multi-Engine, 4,400-10,000 lbs	65	93	126	109	104
Multi-Engine, 10,000-33,000 lbs	19	38	15	24	48
Transports—TOTAL	152	159	170	217	260
Passenger Aircraft, Over 33,000 lbs	140	149	160	205	256
Cargo Aircraft, Over 33,000 lbs	6	2	4	8	1
Other, Over 33,000 lbs, Incl. Pass./Cargo Combi	6	8	6	4	3
Other Aircraft—TOTAL	277	494	912	1,644	1,700[b]
Used or Rebuilt Aircraft	277	494	912	1,644	1,700
Other Aircraft, Including Balloons, Gliders & Kites[a]	NA	NA	NA	NA	2,601
TOTAL VALUE (Millions of Dollars)	$6,694	$7,365[r]	$7,518	$10,296[r]	$13,447
Helicopters—TOTAL	$ 210	$ 277	$ 201	$ 219	$ 156
Under 2,200 lbs	17[r]	29	27	30	29
Over 2,200 lbs	192	248	174	189	127
General Aviation—TOTAL	191	243	295	348	419
Single-Engine	48	28	26	47	62
Multi-Engine, Under 4,400 lbs	14	13	8	12	9
Multi-Engine, 4,400-10,000 lbs	86[r]	133	219	239	184
Multi-Engine, 10,000-33,000 lbs	44	69	42	49	164
Transports—TOTAL	5,518	6,276	6,377	8,766	12,313
Passenger Aircraft, Over 33,000 lbs	4,643	5,352	5,635	7,770	11,859
Cargo Aircraft, Over 33,000 lbs	334	186	208	599	90
Other, Over 33,000 lbs, Incl. Pass./Cargo Combi	541	738	534	396	364
Other Aircraft—TOTAL	775	569	645	963[r]	560
Used or Rebuilt Aircraft	333	501	503	639	533
Other Aircraft, Including Balloons, Gliders & Kites[a]	442	68	141	323	27

Source: Aerospace Industries Association, based on data from International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Included spacecraft until 1989.
b Numbers of gliders, balloons, & kites excluded from civil aircraft totals.
NA Not available.
r Revised.

U.S. EXPORTS OF CIVIL HELICOPTERS[a]

Calendar Years 1985-1989

Region of Destination	1985	1986	1987[r]	1988	1989
TOTAL NUMBER EXPORTED	137	210	242	280	294
Canada & Greenland	12	12	13	17	11
Latin America & Caribbean	25	39	42	25	54
Europe	18	45	97	131	170
Middle East	6	26	10	15	6
Asia	51	54	46	52	51
Oceania	18	19	27	31	33
Africa	7	15	7	9	9
TOTAL VALUE (Millions of Dollars)	$209.8	$277.3	$200.5	$218.6	$155.5
Canada & Greenland	$ 5.0	$ 3.2	$ 4.9	$ 5.2	$ 2.6
Latin America & Caribbean	19.0	24.4	47.8	24.5	39.7
Europe	5.4	25.6	37.7	36.0	37.1
Middle East	24.5	78.7	53.1	70.6	5.4
Asia	141.1	125.7	47.0	68.1	60.0
Oceania	9.5	7.8	6.1	10.3	9.2
Africa	5.3	11.9	4.0	3.9	1.6

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Excludes used helicopters.
r Revised.

U.S. IMPORTS OF CIVIL HELICOPTERS[a]

Calendar Years 1985-1989

Country of Origin	1985	1986	1987	1988	1989
TOTAL NUMBER IMPORTED	60	87	98	114	124
Canada	—	—	32	33	52
France	13	21	29	30	45
Germany	35	55	33	43	25
Italy	8	8	4	7	2
United Kingdom	4	3	—	1	—
TOTAL VALUE (Millions of Dollars)	$44.7	$62.6	$ 79.3	$103.9	$108.7
Canada	$ —	$ —	$ 18.9	$ 21.5	$ 44.5
France	13.7	10.8	24.0	21.6	32.0
Germany	19.9	43.9	31.2	50.1	28.9
Italy	3.9	5.7	5.2	10.5	3.3
United Kingdom	7.2	2.2	—	0.2	—

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Excludes used helicopters.

U.S. EXPORTS OF GENERAL AVIATION AIRCRAFT[a]

Calendar Years 1985-1989

Region of Destination	1985	1986	1987[r]	1988	1989
TOTAL NUMBER EXPORTED ...	484	464	487	643	1,597
Canada & Greenland	44	50	25	14	49
Latin America & Caribbean	175	166	93	100	161
Europe	111	146	213	322	735
Middle East	33	8	27	2	8
Asia	55	42	67	50	292
Oceania	49	33	33	125	190
Africa	17	19	29	30	162
TOTAL VALUE (Millions of Dollars)	$191.1	$243.1	$295.1	$347.7	$419.4
Canada & Greenland	$ 15.1	$ 10.5	$ 12.0	$ 12.8	$ 11.9
Latin America & Caribbean	44.0	48.6	51.4	114.0	120.6
Europe	57.2	92.6	148.6	126.7	170.2
Middle East	3.9	6.8	1.6	0.1	4.7
Asia	40.4	48.8	49.8	38.7	46.0
Oceania	19.4	16.7	3.4	35.8	18.6
Africa	11.1	19.0	28.4	19.6	47.4

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a All fixed-wing aircraft under 33,000 pounds.
r Revised.

U.S. IMPORTS OF GENERAL AVIATION AIRCRAFT[a]

Calendar Years 1985-1989

Country of Origin	1985	1986	1987	1988	1989
TOTAL NUMBER IMPORTED	203	297	278	269	1,243
Brazil	10	13	20	30	30
Canada	26	34	34	40	580
France	49	99	76	60	65
Israel	9	13	8	5	55
Japan	8	10	12	29	—
Netherlands	6	10	—	—	1
United Kingdom	58	79	80	64	472
Other	37	39	48	41	41
TOTAL VALUE (Millions of Dollars)	$672.7	$1,053.5	$1,337.0	$1,369.0	$1,160.1
Brazil	$ 26.3	$ 62.8	$ 97.8	$ 163.8	$ 175.6
Canada	173.1	229.8	209.6	268.6	293.5
France	83.9	196.1	510.5	532.7	335.0
Israel	33.0	54.8	30.7	24.6	44.5
Japan	7.7	8.6	12.6	23.9	—
Netherlands	35.0	56.9	—	—	—[b]
United Kingdom	200.7	297.9	301.9	271.7	238.4
Other	113.0	146.6	173.9	83.7	73.0

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a All fixed-wing aircraft under 33,000 pounds.
b Less than $50,000.

U.S. EXPORTS OF COMMERCIAL TRANSPORT AIRCRAFT

33,000 Pounds and Over Airframe Weight
Calendar Years 1985-1989

Region of Destination	1985	1986	1987	1988	1989
TOTAL NUMBER EXPORTED	152	159	170	217	260
Canada & Greenland	4	2	—	10	9
Latin America & Caribbean	4	9	20	15	28
Europe	72	69	88	127	151
Middle East	8	11	7	4	8
Asia	49	35	40	41	47
Oceania	7	30	8	11	8
Africa	8	3	7	9	9
TOTAL VALUE (Millions of Dollars)	$5,518	$6,276	$6,377	$8,766	$12,313
Canada & Greenland	$ 84	$ 46	$ —	$ 547	$ 535
Latin America & Caribbean	234	343	725	669	726
Europe	2,050	2,284	2,753	3,944	6,335
Middle East	438	613	185	227	631
Asia	2,124	1,957	2,263	2,404	2,951
Oceania	437	927	289	503	640
Africa	151	104	162	471	496

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.

U.S. EXPORTS OF MILITARY AIRCRAFT[a]

Calendar Years 1985-1989

	1985	1986	1987	1988	1989
TOTAL NUMBER OF AIRCRAFT	322r	405r	492r	743	846
Fighters & Fighter Bombers	100r	68	122	87	32
Transports	6	11r	99r	14	74
Helicopters	38	45	39	53	36
New Aircraft, NEC[b]	141	271	218	464	505
Used or Rebuilt Aircraft	37	10	14r	125	199
Airships, Balloons, Gliders, etc.	NA	NA	NA	NA	NA
TOTAL VALUE (Millions of Dollars)	$2,012	$1,502r	$2,628r	$2,157	$ 892
Fighters & Fighter Bombers	$1,351r	$1,016	$1,986	$1,469	$ 368
Transports	102r	156r	363r	212	234
Helicopters	117	123	81	198	180
New Aircraft, NEC[b]	357	178	135	173	53
Used or Rebuilt Aircraft	59	7r	4r	59	56
Airships, Balloons, Gliders, etc.	25	22r	59	46	—[c]

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a Includes aircraft exported under Military Assistance Programs and Foreign Military Sales.
b Includes spacecraft until 1989.
c Products within this category are not designated civil or military by the Harmonized Tariff Schedules. Historically, these products have been predominantly civil.
NA Not available.
NEC Not elsewhere classified.
r Revised.

U.S. EXPORTS OF AIRCRAFT ENGINES

Calendar Years 1987-1989
(Millions of Dollars)

	1987r		1988		1989	
	Number	Value	Number	Value	Number	Value
TOTAL	4,903	$1,364	8,746	$1,792	12,570	$2,184
Turbine Engines-New	989	$ 776	1,289	$1,093	3,917	$2,053
Civil	865	652	1,111	899	3,031	1,856
Military	124	124	178	194	886	198
Turbine Engines-Used	837	531	1,197	612	(a)	(a)
Civil	778	501	1,120	593	(a)	(a)
Military	59	30	77	19	(a)	(a)
Piston Engines	3,077	57	6,260	87	8,653	131
Civil, New, Under 500 HP	922	13	1,543	17	1,964	19
Civil, New, Over 500 HP	286	15	1,072	22	423	13
Civil, Used	1,620	25	2,976	38	4,036	70
Military	249	4	669	10	2,230	38

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a The Harmonized Tariff Schedule combines new and used turbine engines into a single category.
r Revised.

U.S. IMPORTS OF TURBINE AIRCRAFT ENGINES[a]

Calendar Years 1987-1989
(Values in Millions of Dollars)

	1987		1988		1989	
	Number	Value	Number	Value	Number	Value
Turbine Engines	2,136	$1,306	2,823	$1,051	2,283	$1,921
Civil	1,656	1,110	2,514	951	(b)	(b)
Military	480	196	309	100	(b)	(b)

Source: Aerospace Industries Association, based on data from the International Trade Administration.
NOTE: International trade reported using Harmonized Tariff Schedules after 1988.
a New and used.
b The Harmonized Tariff Schedule combines military and civil turbine engines into a single category.

EXPORT-IMPORT BANK LENDING AUTHORITY AND GROSS AUTHORIZATIONS SUMMARY

Fiscal Years 1981-1990
(Millions of Dollars)

LOANS

Year	Lending Authority	Authorizations Summary		
		Direct Loans[a]		
		TOTAL	Direct Credits	Other[b]
1981	$ 5,461	$5,431	$5,079[c]	$ 352
1982	4,400	3,516	3,104	412
1983	4,400	845	685	160
1984	3,865	1,465	1,122	343
1985	3,865	659	320	339
1986	1,059	578	371	207
1987	680	599	332	267
1988	693	685	465	220
1989	719	719	517	202
1990[E]	612	NA	NA	NA

GUARANTEES AND INSURANCE

Year	Lending Authority	Authorizations Summary		
		TOTAL	Guarantees	Insurance
1981	$ 8,059	$7,416	$1,506	$5,910
1982	9,220	5,832	727	5,105
1983	9,000	8,525	1,741	6,784
1984	10,000	7,151	1,333	5,818
1985	10,000	7,850	1,320	6,530
1986	11,484[d]	5,508	1,128	4,380
1987	11,355	7,958	1,514	6,444
1988	13,406	5,735	601	5,134
1989	17,901	5,637	1,292	4,345
1990[E]	10,191	NA	NA	NA

Source: Export-Import Bank of the United States.
NOTE: Details may not add to totals because of rounding.
a The value of Direct Loans may exceed Lending Authority because of the inclusion in Direct Loans of the full amount of Certificates of Loan, portions of which are subsequently sold to commercial banks.
b Includes discount loans, medium term, and small business credits.
c Includes $34 million from the Cooperative Financing Facility program discontinued after 1981.
d Includes $1,800 million proposed I-MATCH Program, which would replace direct lending and would allow an estimated $100 million in commercial loan interest buy-down.
E Estimate. Latest year represents Administration's budget proposal.
NA Not available.

EXPORT-IMPORT BANK
TOTAL AUTHORIZATIONS OF LOANS AND GUARANTEES AND AUTHORIZATIONS IN SUPPORT OF AIRCRAFT EXPORTS

Fiscal Years 1979-1989
(Millions of Dollars)

Year	TOTAL AUTHORIZATIONS	Authorizations in Support of Aircraft Exports			
		TOTAL	Percent of TOTAL Authorizations	Commercial Jet Aircraft[a]	Other Aircraft[b]
LOANS[c]					
1979	$4,475	$1,469.4	32.8%	$1,399.4	$ 70.0
1980	4,578	1,743.3	38.1	1,692.6	50.7
1981	5,431	2,576.6	47.4	2,550.3	26.3
1982	3,516	263.9	7 5	199.1	64.8
1983	845	396.7	46.9	383.8	12.9
1984	1,465	608.0	41.5	531.8	76.2
1985	659	39.7	6.0	12.6[r]	27.1[r]
1986	578	54.6	9.4	46.4[r]	8.2[r]
1987	599	17.0[r]	2.8[r]	13.3[r]	3.7[r]
1988	685	—	—	—	—
1989	695	166.4	23.9	158.0	8.4
GUARANTEES[d]					
1979	$ 908	$ 261.4	28.8%	$ 239.3	$ 22.1
1980	2,510	1,131.9	45.1	1,088.1	43.8
1981	1,506	562.6	37.4	533.4	29.2
1982	727	104.2	14.3	78.4	25.8
1983	1,741	629.6	36.2	601.3	28.3
1984	1,333	355.5	26.7	293.5	62.0
1985	1,320	322.4	24.4	288.9[r]	33.5[r]
1986	1,128	329.2	29.2	277.4	51.8
1987	1,506[r]	808.3	53.4	808.3[r]	—[r]
1988	601	89.2[r]	14.8[r]	73.4[r]	15.8[r]
1989	1,293	496.4	38.4	390.4	106.0

Source: Export-Import Bank of the United States.

a Includes complete aircraft, engines, parts, and retrofits.

b Includes business aircraft, general aviation aircraft, helicopters, and related goods and services.

c Loans are commitments for financing by the Export-Import Bank to foreign buyers of U.S. equipment and services, including Direct Credits, loans authorized under the Cooperative Financing Facility (CFF), (until the termination of the CFF program in 1981), and Discount Loans, which are made by the Export-Import Bank to commercial banks and which subsequently may be guaranteed by the Export-Import Bank, in which case the value of the loans is also included with Guarantees.

d Guarantees by the Export-Import Bank provide assurances of repayment of principal and interest on loans made by private lending institutions, such as commercial banks, for major export transactions. Excludes insurance.

r Revised.

EXPORT-IMPORT BANK
SUMMARY OF COMMERCIAL JET AIRCRAFT AUTHORIZATIONS FOR LOANS[a] AND GUARANTEES[b]

Fiscal Years 1957-1989
(Values in Millions of Dollars)

Year	No. of Jet Aircraft[c]		Export Value[c]		No. of New Commitments		Gross Authorizations	
	Loans	Guarantees	Loans	Guarantees	Loans	Guarantees	Loans	Guarantees
New Authorizations:								
1957[d]-1971	645	86	$ 6,311	$ 581	217	163	$ 2,796	$ 827
1972	145	2	1,334	9	44	29	475	183
1973	129	4	1,729	25	60	23	690	191
1974	189	—	2,195	—	79	22	895	133
1975	136	1	2,070	5	64	10	691	64
1976	77	6	1,017	139	34	11	398	87
Tr.Qtr.	15	5	219	182	6	3	94	59
1977	31	25	330	902	16	14	138	294
1978	29	5	479	253	18	5	189	77
1979	118	7	2,938	317	35	10	1,399	239
1980	136	21	3,975	901	36	24	1,693	1,088
1981	121	18	4,568	637	26	17	2,550	533
1982	11	6	441	113	5	2	199	78
1983	21	9	779	619	3	4	384	601
1984	37	8	1,023	327	7	4	532	294
1985	—	14	19	481	1	5	13	289
1986	3	13[r]	74	451	1	9	46	277
1987	—	27[r]	22	1,449	1[r]	14	13[r]	808
1988	—	2	—	97	—	2[r]	—	73[r]
1989	3	5	253	459	1	2	158	390
Cumulative New Authorizations	1,846	264	$29,776	$7,947	654	373	$13,353	$6,585
Transfers, Reversals, & Participation	—	—	(8)	8	4	—	(140)	(20)
Cumulative Gross Authorizations (net of Adjustments)	1,846	264	$29,768	$7,955	658	373	$13,213	$6,565

Source: Export-Import Bank of the United States.

a Loans are commitments for direct financing by the Export-Import Bank to foreign buyers of U.S. equipment and services, including Direct Credits and loans authorized under the Cooperative Financing Facility (CFF) until the termination of the CFF program in 1981, but excluding Discount Loans, which are made by the Export-Import Bank to commercial banks and which subsequently may be guaranteed by the Export-Import Bank, in which case the value of the loans is included with Guarantees.

b Guarantees by the Export-Import Bank provide assurances of repayment of principal and interest on loans made by private lending institutions, such as commercial banks, for major export transactions.

c For Export-Import Bank commitments including both loan and guarantee authorization, number of aircraft and export value reported under "Loans."

d First year of commercial jet aircraft authorizations.

r Revised.

Tr.Qtr. See Glossary.

EXPORT-IMPORT BANK
AUTHORIZATIONS OF LOANS AND GUARANTEES
IN SUPPORT OF EXPORTS OF COMMERCIAL JET AIRCRAFT

Fiscal Years 1986-1989
(Values in Millions of Dollars)

Customer (Country/Airline)	Number and Aircraft Model or Related Product	Export Value	Authorization				
			Loans (Direct Credits)				Guarantees
			Amount	Percent Coverage[a]	Interest Rate	Repayment Terms[b]	Amount
FY 1989							
TOTALS	8 aircraft	$ 712	$293	—	—	—	$605
Algeria/Algerie Air	3 x 737	253	158	62.5	8.95%	24-S	215
Yugoslavia/Jugoslovenski Aerotransport	3 x MD-11	301	—	—	—	—	255
Zimbabwe/Government of	2 x 747	159	135	85.0	9.68%	24-S	135
FY 1988							
TOTALS	2 aircraft	$ 94	—	—	—	—	$ 76
Bangladesh/Bangladesh Biman Corp.	1 x DC-10-30	67	—	—	—	—	50
Israel/El Al	1 x 757	27	—	—	—	—	22
Uganda/Uganda Airlines	707 Hushkit	3	—	—	—	—	3
FY 1987							
TOTALS	32 aircraft	$1,411	$ 7	—	—	—	$768
Brazil/VARIG	6 x 767	324	—	—	—	—	275
Israel/El Al	2 x 757	59	—	—	—	—	50
Japan/All Nippon	15 x 767	857	—	—	—	—	300
Mauritius/Air Mauritius	2 x 767	5	—	—	—	—	5
Mauritius/ Air Mauritius	spare parts for 2 x 767	16	7	42.5	9.10%	20-S	7
Nepal/Royal Nepal Airlines	2 x 757	76	—	—	—	—	64
Yugoslavia/Jugoslovenski Aerotransport	2 x 737	53	—	—	—	—	45
Yugoslavia/Aviogenex	2 x 737	18	—	—	—	—	14
Yugoslavia/Aviogenex	1 x 737	19	—	—	—	—	15

(Continued on next page)

EXPORT-IMPORT BANK
LOANS AND GUARANTEE AUTHORIZATIONS (Continued)

Customer (Country/Airline)	Number and Aircraft Model or Related Product	Export Value	Authorization				
			Loans (Direct Credits)				Guarantees
			Amount	Percent Coverage[a]	Interest Rate	Repayment Terms[b]	Amount
FY 1986							
TOTALS	16 aircraft	$ 525.5	$ 46.3	—	—	—	$277.4
Brazil/Ministry of Aeronautics	tools for engine overhaul	6.9	—	—	—	—	5.9
Chile/Lan-Chile, S.A.	2 x 767	96.2	—	—	—	—	40.0
Finland/Finnair	3 x MD-87	74.2	46.3	62.5	8.4	20-S	—
Gabon/Air Gabon	1 x 100-30	22.7	—	—	—	—	19.3
Jamaica/Air Jamaica	engines	4.3	—	—	—	—	3.6
Yugoslavia/Inex Adria Airways	engines	2.2	—	—	—	—	1.9
Yugoslavia/Jugoslovenski Aerotransport	2 x 737	69.9	—	—	—	—	59.4
Yugoslavia/Jugoslovenski Aerotransport	1 x MD-82	21.8	—	—	—	—	18.6
Zimbabwe/Government of	3 x 737	66.2	—	—	—	—	56.2
Japan/All Nippon Airways	4 x 767	161.1	—	—	—	—	72.5

Source: Aerospace Industries Association, based on data from the Export-Import Bank of the United States.
NOTE: For definitions of Loans and Guarantees, see Export-Import Bank tables on previous pages.
a Amount of loan as percent of export value.
b Number of payments and frequency (S = semi-annual).
r Revised.

90-91

Aerospace industry employment in 1989 increased somewhat relative to the previous year. According to the Bureau of Labor Statistics, aerospace employment was 1,321,000 in 1989, which compares with 1,317,000 in 1988.

The 1989 figure represented 6.7 percent of the total employment in all U.S. manufacturing industries, down from the previous year's 6.8 percent. It also represented 11.5 percent (same as in 1988) of U.S. companies producing durable goods.

Following the historical pattern, more than half (53 percent) of the aerospace labor force was employed in the manufacture of aircraft, engines and parts. Employment in that category totaled 702,000, up from 695,000 in 1988.

In the industry segment engaged in fabrication of missile and space systems, employment averaged 208,000. This compares with 212,000 in the previous year. Average employment in all other aerospace R&D/manufacturing activities was 411,000, up from 409,000.

Like total employment, the number of production workers in the industry remained relatively constant, increasing by 1,000 to a total of 436,000. In aircraft, engines and parts manufacture, production workers numbered 340,000, 78 percent of the total; in missiles and space systems the number was 63,000 and in the "other" category 33,000.

The aerospace payroll increased at a rate of just over four percent. In 1989, it amounted to $34.9 billion, up from $33.5 billion in 1988; both figures include lump sum payments made

by many aerospace firms in lieu of general wage or cost of living increases. The aerospace payroll represented 6.4 percent (same as in 1988) of combined payroll outlays by all U.S. manufacturing industries.

Average weekly earnings—again including lump sums—among aerospace employees were $610, up from $585 in the previous year. Average hourly earnings were $14.41, up from $13.77. The average work week was 42.2 hours, compared with 42.5 hours in 1988.

In a yearend geographic breakdown of industry employment, the Pacific region dominated, as is customary. Pacific area companies accounted for 44.9 percent of total employment. In second place was the Middle Atlantic region (14.6 percent) and in third the West North Central region (12.3 percent). Next in order, were South Central (8.2 percent), South Atlantic (6.1 percent), New England (5.8 percent), Mountain (5 percent), and East North Central (3.1 percent).

Pacific also dominated in a breakdown by product group. In civil aircraft manufacture, Pacific companies reported employment amounting to 56.1 percent of the labor force. New England & Mid-Atlantic combined (16.7 percent) and West North Central (6.3 percent) followed.

In military aircraft production, Pacific led with 28.3 percent, followed by New England (17 percent), South Central (15.5 percent) and West North Central (15.3 percent). In space systems manufacture, Pacific employment amounted to 61.5 percent; among the other regions, only Mountain (12.5 percent) showed a significant percentage. In missile systems manufacture it was Pacific & Mountain combined (44.5 percent), New England (28.2 percent) and South Atlantic (13.9 percent).

ANNUAL AVERAGE EMPLOYMENT IN ALL MANUFACTURING, DURABLE GOODS, AND AEROSPACE INDUSTRIES

Calendar Years 1977-1989
(Thousands of Employees)

Year	All Manufacturing Industries	Durable Goods Industries	Aerospace Industry[a]		
			TOTAL	As Percent of	
				All Manufacturing	Durable Goods
1977	19,682	11,597	820	4.2%	7.1%
1978	20,505	12,274	901	4.4	7.3
1979	21,040	12,760	1,034	4.9	8.1
1980	20,285	12,187	1,108	5.5	9.1
1981	20,170	12,109	1,115	5.5	9.2
1982	18,781	11,039	1,063	5.7[r]	9.6
1983	18,434	10,732	1,043	5.7[r]	9.7
1984	19,378	11,505	1,084	5.6	9.4
1985	19,260	11,490	1,180	6.1	10.3
1986[r]	18,965	11,230	1,273	6.7	11.3
1987[r]	19,024	11,194	1,314	6.9	11.7
1988[r]	19,403	11,437	1,317	6.8	11.5
1989	19,612	11,536	1,321	6.7	11.5

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly) and Aerospace Industries Association estimates.
NOTE: AIA employment data for 1977-1986 were substantially revised in 1987 to better account for aerospace industry related employment.
a See Glossary for detailed explanation of "Aerospace Employment."
r Revised.

ANNUAL PAYROLL[a]
AEROSPACE INDUSTRY AND ALL MANUFACTURING INDUSTRIES

Calendar Years 1977-1989
(Millions of Dollars)

Year	All Manufacturing Industries[b]	Aerospace Industry[a]			Aerospace As Percent of All Manufacturing
		TOTAL	Production Workers	Other	
1977	$266,700	$10,289	$ 4,116	$ 6,173	3.9%
1978	300,100	12,374	5,034	7,339	4.1
1979	334,800	15,545	6,648	8,897	4.6
1980	355,600	18,484	7,875	10,609	5.2
1981	386,700	20,407	8,380	12,027	5.3
1982	384,000	21,237	8,264	12,973	5.5
1983	397,400	22,149	8,289	13,860	5.6
1984	439,100	24,350	8,977	15,373	5.5
1985	460,900	27,409	10,093	17,317	5.9
1986	473,200	30,309	11,327	18,982	6.4
1987	490,300	31,876	12,011	19,865	6.5
1988	524,000	33,283	12,047	21,237	6.4
1989	541,800	34,639	12,553	22,086	6.4

AEROSPACE—INCLUDING LUMP-SUM PAYMENTS[c]

Year	TOTAL	Production Workers	Other	Aerospace As Percent of All Manufacturing
1984	$24,417	$ 9,044	$15,373	5.6%
1985	27,485	10,168	17,317	6.0
1986	30,439	11,456	18,982	6.4
1987	32,089	12,224	19,865	6.5
1988	33,478	12,241	21,237	6.4
1989	34,850	12,764	22,086	6.4

Source: Bureau of Economic Analysis, "Survey of Current Business" (Monthly) and Aerospace Industries Association estimates based on Bureau of Labor Statistics, "Employment and Earnings" (Monthly).

a Revised figures based on combined annual average employment and average weekly earnings for SICs 372 and 376.

b See Glossary for explanation of "Payroll, All Manufacturing."

c Many aerospace manufacturers have included lump-sum payments in labor settlements since late 1983 in lieu of general wage increases and/or cost of living adjustments. These payments are reported by BLS in separate wage series for SICs 3271 & 3761 and are included by AIA in the totals for production workers and all aerospace.

EMPLOYMENT IN THE AEROSPACE INDUSTRY[a]

Calendar Years 1977-1989
(Annual Average, Thousands of Employees)

Year	TOTAL	Aircraft, Engines, & Parts (SIC 372)	Missiles & Space Vehicles (SIC 376)	Other[b]
TOTAL EMPLOYMENT				
1977	820	482	83	255
1978	901	527	93	280
1979	1,034	611	102	321
1980	1,108	652	111	345
1981	1,115	646	123	347
1982	1,063	601	131	330
1983	1,043	578	141	324
1984	1,084	593	154	337
1985	1,180	636	177	367
1986	1,273	678	200	396
1987[r]	1,314	700	206	409
1988[r]	1,317	695	212	409
1989	1,321	702	208	411
PRODUCTION WORKERS				
1977	295	247	26	22
1978	329	275	29	25
1979	394	332	33	29
1980	421	355	35	31
1981	410	343	37	31
1982	373	305	40	28
1983	354	283	46	26
1984	363	285	52	27
1985	395	304	62	29
1986	432	333	67	32
1987	449	349[r]	67[r]	33
1988	435	339[r]	64[r]	32
1989	436	340	63	33

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly) and Aerospace Industries Association estimates.
NOTE AIA employment data for 1977-1986 were substantially revised in 1987 to better account for aerospace industry related employment.
a See Glossary for detailed explanation of "Aerospace Employment."
b Communications, navigation, flight control, and displays (aerospace-related portions of SICs 3662, 381, & 382).
r Revised.

EMPLOYMENT IN THE AIRCRAFT, ENGINES, AND PARTS INDUSTRY[a]

Calendar Years 1977-1989
(Annual Average, Thousands of Employees)

Year	TOTAL (SIC 372)	Airframes (SIC 3721)	Engines and Parts (SIC 3724)	Other Parts & Equipment (SIC 3728)
TOTAL EMPLOYMENT				
1977	481.7	270.4	120.9	90.4
1978	527.2	288.3	133.5	105.5
1979	610.8	333.2	151.6	126.1
1980	652.3	349.3	162.9	140.1
1981	645.5	344.2	162.5	138.8
1982	601.1	319.9	148.8	132.3
1983	578.3	304.7	140.1	133.6
1984	592.7	306.1	140.2	146.4
1985	635.8	325.6	147.5	162.7
1986	677.7	338.9	153.6	185.1
1987[r]	700.1	356.4	158.2	185.5
1988[r]	695.4	367.5	154.3	173.6
1989	702.2	379.8	150.6	171.9
PRODUCTION WORKERS				
1977	246.8	124.4	66.6	55.8
1978	275.4	133.9	75.3	66.2
1979	332.1	165.9	86.4	79.8
1980	354.6	173.7	93.0	88.0
1981	343.0	167.0	92.4	83.6
1982	305.4	144.7	84.2	76.6
1983	282.5	131.5	74.7	76.3
1984	284.6	128.2	73.0	83.5
1985	303.8	135.5	74.8	93.6
1986	332.6	146.6	78.7	107.4
1987[r]	349.2	159.1	80.5	109.6
1988[r]	338.6	161.7	76.4	100.5
1989	340.4	166.4	75.4	98.6

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly).
NOTE: Detail may not add to totals because of rounding.
a See Glossary for detailed explanation of "Aerospace Employment."
r Revised.

AEROSPACE INDUSTRY EMPLOYMENT[c] BY OCCUPATIONAL CLASSIFICATION

As of December[a] 1977-1989
(Thousands of Employees)

Year	TOTAL	Production Workers	Scientists & Engineers	Technicians	Others
1977[b]	665	280	139	46	200
1978	720	337	130	50	203
1979	842	396	146	56	244
1980	902	414	158	62	268
1981	900	399	156	69	276
1982	831	367	151	59	254
1983[b]	830	351	156	66	257
1984	850	364	160	67	259
1985	939	392	175	67	305
1986	967	446	178	66	277
1987	992	448	182	73	289
1988	982	435	189	66	292
1989[bp]	983	443	183	65	292
1990[E]	963	438	179	64	282

Source: Aerospace Industries Association, company reports and Bureau of Labor Statistics, "Employment and Earnings" (Monthly).

NOTE: AIA employment data for 1977-1986 were substantially revised in 1987 to better account for aerospace related employment.

a End-of-year figures often differ from annual averages appearing in other tables.

b Industry strike during this period.

c Totals for employment by occupational classification reflect only establishments in SICs 372, 376, 3662, 381, and 382. As a result, they do not match the totals for aerospace employment by product group which include other industries with employment related to aerospace.

E Estimate.

p Preliminary.

GEOGRAPHIC DISTRIBUTION OF AEROSPACE EMPLOYMENT[a] BY OCCUPATIONAL CLASSIFICATION AND PRODUCT GROUP

As of December 1989

PERCENT DISTRIBUTION BY OCCUPATION

Region	TOTAL	Production Workers	Scientists & Engineers	Technicians	All Others
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%
New England	5.8%	6.6%	6.1%	6.1%	4.8%
Middle Atlantic	14.6	14.4	14.9	10.7	15.6
East North Central	3.1	3.9	3.0	3.3	2.4
West North Central	12.3	13.3	12.1	15.3	10.5
South Atlantic	6.1	4.9	6.3	7.0	7.1
South Central	8.2	9.5	7.2	5.1	8.0
Mountain	5.0	3.7	6.2	5.1	5.5
Pacific	44.9	43.7	44.2	47.4	46.1

PERCENT DISTRIBUTION BY PRODUCT GROUP

Region	Total	Aircraft		Missiles	Space	Other	
		Civil	Military			Aero	Non-Aero
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
New England	14.5%	16.7%	17.0%	28.2%	9.6%	18.8%	18.4%
Middle Atlantic	8.2		12.1	2.0		10.1	10.5
East North Central	5.3	5.3	5.6	1.9	3.8	6.5	15.3
West North Central	11.3	6.3	15.3	8.9	2.3	18.5	3.4
South Atlantic	6.9	4.3	2.7	13.9	7.4	9.3	1.0
South Central	7.9	5.9	15.5	0.6	2.9	4.3	10.7
Mountain	4.6	5.4	3.5	44.5	12.5	32.5	1.0
Pacific	41.3	56.1	28.3		61.5		39.7

Source: Aerospace Industries Association, company reports.

NOTE: Data for two regions are combined where employment for one region within a product group represented three or fewer companies.

a Employment in 40 surveyed aerospace manufacturing companies accounted for approximately two-thirds of total industry employment.

TOTAL EMPLOYMENT AND SCIENTISTS & ENGINEERS IN COMMERCIAL TRANSPORT AIRCRAFT & HELICOPTER MANUFACTURING ESTABLISHMENTS[a]

As of December 1977-1990

Year	Commercial Transport Aircraft		Helicopters	
	Total	Scientists & Engineers	Total	Scientists & Engineers
1977[b]	55,900	8,100	21,100	3,500
1978	58,700	8,700	24,200	3,300
1979	99,800	12,900	27,500	3,000
1980	106,500	13,700	29,800	3,200
1981	84,000	12,000	28,000	3,000
1982	69,800	11,100	26,600	3,100
1983[b]	48,200	8,400	27,600	3,500
1984	57,600	9,300	31,300	3,800
1985	58,700	10,000	34,200	4,300
1986	79,100	12,900	37,300	4,000
1987	88,100	14,400	30,500	3,300
1988	99,100	15,900	29,100	3,400
1989[p,b]	113,000	16,300	29,900	3,700
1990[E]	109,400	15,800	31,000	3,800

Source: Aerospace Industries Association, company reports.

NOTE: AIA employment data for 1977-1987 were substantially revised in 1987 to better account for aerospace industry related employment.

a Includes only establishments identified as prime manufacturers of commercial transport aircraft and of civil and military helicopters. Excludes subcontractors and propulsion manufacturers.

b Industry strike during this period.

E Estimate.

p Preliminary.

AVERAGE HOURLY EARNINGS IN THE AEROSPACE INDUSTRY

Production Workers Only
Calendar Years 1974-1989

Year	TOTAL[a]	Aircraft (SIC 372)				Guided Missiles, Space Vehicles & Parts (SIC 376)	
		TOTAL[a]	Airframes (SIC 3721)	Engines & Parts (SIC 3724)	Other Parts & Equipment (SIC 3728)	TOTAL[a]	Guided Missiles & Space Vehicles (SIC 3761)
AVERAGE HOURLY EARNINGS[b]							
1974	$ 5.43	$ 5.42	$ 5.58	$ 5.41	$ 5.05	$ 5.48	$ 5.44
1975	6.00	6.00	6.21	6.04	5.47	6.02	5.99
1976	6.44	6.44	6.63	6.46	5.95	6.48	6.49
1977	6.93	6.92	7.07	7.05	6.44	7.04	7.15
1978	7.54	7.54	7.70	7.80	6.93	7.56	7.72
1979	8.26	8.26	8.50	8.53	7.48	8.25	8.38
1980	9.27	9.28	9.66	9.42	8.40	9.22	9.33
1981	10.29	10.31	10.74	10.41	9.35	10.06	10.34
1982	11.20	11.23	11.85	11.16	10.17[r]	10.95[r]	11.21
1983	11.79	11.82	12.58	11.61	10.73	11.59[r]	11.86
1984	12.24	12.32	12.91	12.40	11.37	11.82	12.01
1985	12.54	12.62	13.18	12.85	11.65[r]	12.14	12.36
1986	12.75	12.86	13.48	13.08	11.90	12.20	12.48
1987	13.10[r]	13.17[r]	13.74	13.33	12.23	12.73[r]	13.90[r]
1988	13.55[r]	13.62[r]	14.18	13.80	12.60[r]	13.15[r]	13.56
1989	14.15	14.23	14.89	14.42	12.99	13.75	14.20
AVERAGE HOURLY EARNINGS INCLUDING LUMP-SUM WAGE PAYMENTS[c]							
1984	$12.34[r]	$12.42[r]	$13.11	$12.40	$11.37	$11.92[r]	$12.14
1985	12.65[r]	12.73[r]	13.40	12.85	11.65	12.29[r]	12.56
1986	12.90[r]	13.02	13.80	13.08	11.90	12.33[r]	12.66
1987	13.33[r]	13.44[r]	14.32	13.33	12.23	12.80[r]	13.19
1988	13.77[r]	13.85[r]	14.65	13.80	12.60[r]	13.36[r]	13.87
1989	14.41	14.48	15.39	14.42	12.99	14.01	14.59

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly) and Aerospace Industries Association estimates.

a TOTAL columns are employment-based weighted averages.

b Includes overtime premiums.

c Many aerospace manufacturers have included lump-sum payments in labor settlements since late 1983 in lieu of general wage increases and/or cost of living adjustments. These payments are reported by BLS in separate wage series for SICs 3721 & 3761 and are included by AIA in totals.

r Revised.

AVERAGE WEEKLY EARNINGS IN THE AEROSPACE INDUSTRY

Production Workers Only
Calendar Years 1974-1989

Year	TOTAL[a]	Aircraft (SIC 372)				Guided Missiles, Space Vehicles & Parts (SIC 376)	
		TOTAL	Airframes (SIC 3721)	Engines & Parts (SIC 3724)	Other Parts & Equipment (SIC 3728)	TOTAL[a]	Guided Missiles & Space Vehicles (SIC 3761)
AVERAGE HOURLY EARNINGS[b]							
1974	$221.10	$220.59	$222.08	$221.81	$213.62	$226.32	$224.67
1975	247.53	247.80	255.85	247.04	228.65	245.01	242.00
1976	263.31	263.40	273.16	259.69	245.74	262.44	260.90
1977	289.76	289.95	296.23	291.87	273.70	287.94	289.58
1978	318.05	318.19	324.17	325.26	298.68	316.76	315.75
1979	350.64	351.05	359.55	360.82	322.39	346.50	347.77
1980	388.71	389.76	403.79	393.76	357.84	378.02	383.46
1981	424.31	425.80	443.56	421.61	396.44	410.45	419.80
1982	459.83[r]	461.55	484.67	454.21	426.12[r]	446.76[r]	460.73
1983	485.99[r]	486.98	513.26[r]	476.01	452.81	479.83[r]	494.56
1984	513.17[r]	516.21	531.89	523.28	485.50	496.44	508.02
1985	530.59[r]	533.83[r]	546.97	542.27	505.61[r]	514.74[r]	526.54
1986	544.84[r]	550.41[r]	567.51	561.13	520.03[r]	517.28	532.90
1987	555.63[r]	558.41[r]	578.45	566.53	523.44	541.03[r]	556.33[r]
1988	576.00[r]	577.49[r]	595.56	582.36	544.32[r]	568.08[r]	585.79
1989	597.85	599.08	616.45	615.73	555.97	591.25	610.60
AVERAGE WEEKLY EARNINGS INCLUDING LUMP-SUM PAYMENTS[c]							
1984	$516.99[r]	$519.97[r]	$540.13	$523.28	$485.50	$500.61[r]	$513.52
1985	534.57[r]	537.32[r]	556.10	542.27	505.61	521.10[r]	535.06
1986	551.07[r]	556.78[r]	580.98	561.13	520.03	522.10[r]	540.58[r]
1987	565.49[r]	569.56[r]	602.87	566.53	523.44	544.11[r]	560.58
1988	585.30[r]	586.80[r]	615.30	582.36	544.32[r]	577.33[r]	599.18
1989	607.90	608.89	637.15	615.73	555.97	602.59	627.37

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly) and Aerospace Industries Association estimates.

a TOTAL columns are employment-based weighted averages.

b Includes overtime premiums.

c Many aerospace manufacturers have included lump-sum payments in labor settlements since late 1983 in lieu of general wage increases and/or cost of living adjustments. These payments are reported by BLS in separate wage series for SICs 3721 & 3761 and are included by AIA in totals.

r Revised.

AVERAGE HOURS IN THE AEROSPACE INDUSTRY

Production Workers Only
Calendar Years 1975-1989

AVERAGE WEEKLY HOURS

Year	TOTAL[a]	Aircraft (SIC 372)				Guided Missiles, Space Vehicles & Parts (SIC 376)	Complete Guided Missiles & Space Vehicles (SIC 3761)
		TOTAL	Airframes (SIC 3721)	Engines & Parts (SIC 3724)	Other Parts & Equipment (SIC 3728)		
1975	41.2	41.3	41.2	40.9	41.8	40.7	NA
1976	40.9	40.9	41.2	40.2	41.3	40.5	NA
1977	41.8	41.9	41.9	41.4	42.5	40.9	40.5
1978	42.2	42.2	42.1	41.7	43.1	41.9	40.9
1979	42.5	42.5	42.3	42.3	43.1	42.0	41.5
1980	41.9	42.0	41.8	41.8	42.6	41.0	41.1
1981	41.3	41.3	41.3	40.5	42.4	40.8	40.6
1982	41.1	41.1	40.9	40.7	41.9	40.8	41.1
1983	41.2	41.2	40.8	41.0[r]	42.2	41.4	41.7
1984	41.9	41.9	41.2	42.2	42.7	42.0	42.3
1985	42.3[r]	42.3[r]	41.5	42.2	43.4	42.4[r]	42.6
1986	42.7	42.8	42.1	42.9	43.7	42.4	42.7
1987	42.4	42.4	42.1	42.5	42.8	42.5	42.5
1988	42.5	42.4	42.0	42.2	43.2	43.2	43.2
1989	42.2	42.1	41.4	42.7	42.8	43.0	43.0

AVERAGE WEEKLY OVERTIME HOURS

Year	TOTAL[a]	Aircraft (SIC 372)				Guided Missiles, Space Vehicles & Parts (SIC 376)	Complete Guided Missiles & Space Vehicles (SIC 3761)
		TOTAL	Airframes (SIC 3721)	Engines & Parts (SIC 3724)	Other Parts & Equipment (SIC 3728)		
1975	3.0	3.0	NA	NA	NA	2.7	NA
1976	2.7	2.7	NA	NA	NA	2.7	NA
1977	3.5	3.5	2.8	3.9	4.5	3.2	2.8
1978	4.4	4.4	3.6	5.0	5.3	4.1	3.4
1979	4.7	4.7	4.1	5.1	5.3	4.4	3.8
1980	4.1	4.2	3.5	5.0	4.9	3.6	3.2
1981	3.5	3.5	3.1	3.5	4.4	3.2	2.9
1982	3.2	3.2	2.7	3.6	3.7	3.1	3.1
1983	3.1	3.1	2.5	3.7	3.6	3.3	3.5
1984	3.9	4.0	3.0	5.1	4.6	3.3	3.4
1985	4.6[r]	4.6[r]	3.5	5.4	5.3	4.6	5.0
1986	4.8	4.9	4.2	5.5	5.5	4.4	4.7
1987	4.8	4.9	4.4	5.0	5.4	4.2	4.3
1988	4.7	4.7	4.3	4.6	5.4	4.5	4.6
1989	5.1	5.2	5.0	5.4	5.4	4.4	4.5

Source: Bureau of Labor Statistics, "Employment and Earnings" (Monthly) and Aerospace Industries Association estimates.
a TOTAL columns are employment-based weighted averages.
r Revised.

OCCUPATIONAL INJURY AND ILLNESS INCIDENCE RATES[a] ALL MANUFACTURING AND AEROSPACE INDUSTRIES

Calendar Years 1984-1988

	1984	1985	1986	1987	1988
All Manufacturing:					
Total Cases	10.6	10.4	10.6	11.9	13.1
Lost Workday Cases	4.7	4.6	4.7	5.3	5.7
Nonfatal Cases without Lost Workdays	5.9	5.8	5.9	6.7	7.3
Lost Workdays	77.9	80.2	85.2	95.5	107.4
Aircraft and Parts (SIC 372):					
Total Cases	5.8	6.4	7.0	8.3	9.8
Lost Workday Cases	2.2	2.5	2.6	3.1	3.6
Nonfatal Cases without Lost Workdays	3.6	3.9	4.4	5.2	6.3
Lost Workdays	35.3	43.1	43.8	55.7	67.5
Aircraft (SIC 3721):					
Total Cases	4.5	5.4	6.6	7.4	10.1
Lost Workday Cases	1.6	2.0	2.1	2.6	3.3
Nonfatal Cases without Lost Workdays	2.9	3.5	4.5	4.8	6.7
Lost Workdays	28.3	35.8	38.3	48.0	66.1
Aircraft Engines and Parts (SIC 3724):					
Total Cases	5.3	5.2	5.4	7.1	8.7
Lost Workday Cases	2.8	2.7	2.8	3.4	3.7
Nonfatal Cases without Lost Workdays	2.5	2.5	2.6	3.7	5.0
Lost Workdays	45.9	52.0	48.0	67.4	81.9
Aircraft Parts (SIC 3728):					
Total Cases	8.9	9.4	9.0	10.8	10.3
Lost Workday Cases	2.9	3.4	3.3	3.9	3.9
Nonfatal Cases without Lost Workdays	6.1	6.0	5.7	6.9	6.5
Lost Workdays	40.0	50.1	50.1	60.4	58.5
Guided Missiles, Space Vehicles & Parts (SIC 376):					
Total Cases	2.7	2.8	3.1	4.4	4.6
Lost Workday Cases	1.2	1.2	1.5	2.0	2.2
Nonfatal Cases without Lost Workdays	1.5	1.5	1.6	2.4	2.4
Lost Workdays	21.0	23.1	28.3	34.0	41.3
Guided Missiles & Space Vehicles (SIC 3761):					
Total Cases	2.5	2.5	2.8	4.3	4.6
Lost Workday Cases	1.1	1.2	1.4	2.2	2.3
Nonfatal Cases without Lost Workdays	1.3	1.3	1.4	2.2	2.3
Lost Workdays	20.0	23.0	29.5	37.4	44.6
Space Propulsion Units & Parts (SIC 3764):					
Total Cases	3.3	4.1	4.8	4.5	4.5
Lost Workday Cases	1.5	1.7	1.7	1.8	1.9
Nonfatal Cases without Lost Workdays	1.8	2.4	3.1	2.7	2.6
Lost Workdays	25.0	27.8	29.2	34.3	32.6
Other Space Vehicle Equipment (SIC 3769):					
Total Cases	3.2	3.1	3.1	4.2	NA
Lost Workday Cases	0.9	1.1	1.3	1.2	NA
Nonfatal Cases without Lost Workdays	2.3	2.0	1.8	3.0	NA
Lost Workdays	22.1	20.6	21.0	16.3	NA

Source: Bureau of Labor Statistics, "Occupational Injuries and Illnesses in the United States by Industry" (Annually).

a Defined as the number of injuries and illnesses per 100 full-time workers. Separate incidence rates also available for occupational injuries only.

NA Not available.

FEDERAL CIVILIAN EMPLOYMENT[a] IN THE DEPARTMENT OF DEFENSE

Fiscal Years 1967-1992

Year	TOTAL	Civil Functions[b]	Military Functions[c]
1967	1,225,637	31,980	1,193,657
1968	1,288,130	32,062	1,256,068
1969	1,257,091	31,214	1,225,877
1970	1,159,935	30,293	1,129,642
1971	1,092,804	30,063	1,062,741
1972	1,040,147	30,585	1,009,562
1973	987,281	29,971	957,310
1974	1,002,850	29,072	973,778
1975	983,790	29,069	954,721
1976	951,034	28,648	922,386
1977	940,549	28,912	911,637
1978	933,071	28,962	904,109
1979	914,582	28,592	885,990
1980	907,700	27,700	880,000
1981	981,400	34,400	947,000
1982	1,009,344	31,263	978,081
1983	1,015,779	30,973	984,806
1984	1,040,213	28,681	1,011,532
1985	1,065,551	28,681	1,036,870
1986	1,069,863	28,511	1,041,352
1987	1,059,516	28,199	1,031,317
1988	1,052,848	28,267	1,024,581
1989	1,051,019	27,934	1,023,085
1990[E]	1,041,649	28,115	1,013,534
1991[E]	1,038,412	27,888	1,010,524
1992[E]	1,037,660	27,660	1,010,000

Source: Office of Management and Budget, "The Budget of the United States Government" (Annually)

a Full-time equivalent civilian employment.

b Data are estimated for portions of Civil Functions.

c The Department of Defense is exempt from full-time equivalent controls. Data shown are estimated civilian employment for military functions and military assistance.

E Estimate.

EMPLOYMENT IN NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PROGRAMS

End of Fiscal Years 1960-1991

Year	TOTAL	NASA Employees	Contractor Employees[a]
1960	46,768	10,268	36,500
1961	74,577	17,077	57,500
1962	137,656	22,156	115,500
1963	246,304	27,904	218,400
1964	379,084	31,984	347,100
1965	409,900	33,200	376,700
1966	393,924	33,924	360,000
1967	306,926	33,726	273,200
1968	267,871	32,471	235,400
1969	218,345	31,745	186,600
1970	160,850	31,350	129,500
1971	143,578	29,478	114,100
1972	138,800	27,500	111,300
1973	134,850	26,850	108,000
1974	125,220	25,020	100,200
1975	127,733	24,333	103,400
1976	130,739	24,039	108,000
1977	124,136	23,636	100,500
1978	124,637	23,237	101,400
1979	131,931	22,831	109,100
1980	135,613	22,613	113,000
1981	133,473	21,873	111,600
1982	127,952	21,652	106,300
1983	129,246	22,246	107,000
1984	162,080	22,080	140,000
1985	131,991[r]	21,991[r]	110,000
1986	154,660[r]	21,660[r]	133,000
1987	165,001[r]	22,001[r]	143,000
1988	172,326	22,326	150,000
1989	213,054	23,054	190,000
1990[E]	222,007	24,007	198,000
1991[E]	254,637	24,637	230,000

Source: NASA, "Briefing on the Budget of the United States" (Annually) and NASA Headquarters.

a Includes estimates of manpower for hardware and related contracts, as well as actual work-years for support service contracts. Increase in FY 1984 caused by change in estimating methodology to reflect more accurately the mix of support and development contractors.

E Estimate.

r Revised.

AEROSPACE INDUSTRY WORK STOPPAGES[a]

Calendar Years 1979-1989

Year[b]	Number of Strikes[c]	Number of Workers Involved	Work-Days Idle in Year
1979	12	6,600	103,400
1980	17	4,400	92,900
1981	12	6,100	188,900
1982	4	11,900	45,200
1983	2	8,700	404,100
1984	4	14,600	188,200
1985	4	19,700	289,800
1986	—	—	—
1987	—	—	—
1988	3	10,600	415,800
1989	2	58,500	1,848,000

Source: Bureau of Labor Statistics, "Current Wage Developments" (Monthly).

a Based on SIC 372 of the 1967 Code, which includes missile and space propulsion units and parts and missile and space vehicle equipment not elsewhere classified, but which excludes complete guided missiles and space vehicles.

b Effective 1982, data not available for work stoppages involving fewer than 1,000 employees.

c Strikes beginning during calendar year.

EMPLOYMENT AND COST OF R&D SCIENTISTS AND ENGINEERS ALL INDUSTRIES AND AEROSPACE INDUSTRY

Calendar Years 1975-1989

Year	Employment[a]			Cost per R&D Scientist and Engineer[d]	
	All Industries[b] (Thousands)	Aerospace[c] (Thousands)	Aerospace as a Percent of All Industries	All Industries[b]	Aerospace[c]
1975	363.3	67.5	18.6%	$ 66,500	$ 85,100
1976	364.4	66.9	18.4	72,200	91,300
1977	382.8	72.0	18.8	75,800	91,300
1978	404.4	82.0	20.3	80,400	89,400
1979	423.9	86.5	20.4	87,400	93,300
1980	450.6	85.9	19.1	94,900	101,600
1981	487.8	95.2	19.5	103,900	128,400
1982	509.8	91.1	17.9	111,600*r*	148,800*r*
1983*r*	540.9	103.1	19.1	116,000	143,600
1984*r*	584.1	111.5	19.1	124,000	156,000
1985*r*	622.5	130.2	20.9	130,200	161,700
1986*r*	671.0	144.8	21.6	128,900	153,100
1987*r*	697.3	130.1	18.7	133,900	183,800
1988*r*	708.6	136.4	19.2	138,700	184,300
1989	724.9	142.1	19.6	NA	NA

Source: National Science Foundation.

a Employment as of January. Scientists and engineers working less than full time have been included in terms of their full time equivalent number.

b All manufacturing industries and those non-manufacturing industries known to conduct or finance research and development.

c Standard Industrial Classification codes 372 and 376.

d The arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years, divided into the total R&D expenditures of each industry during the earlier year.

NA Not available.

r Revised.

90-91

Aerospace industry earnings plummeted in 1989, falling more than $1 billion, or roughly 20 percent, below the previous year's level. Net profit after taxes was $3.9 billion, down from $4.9 billion in 1988.

The sharp drop in earnings was due to a number of factors, principally the effects of a wave of defense procurement reforms instituted in the 1980s that generally inhibit contractor profits while increasing risk and financing requirements.

The aerospace profit was achieved on 1989 sales of $118 billion, which compares with $113 billion in 1988.

Expressed as a percentage of sales, the profit amounted to 3.3 percent, down from 4.3 percent in 1988. The aerospace figure was significantly below the average for all U.S. manufacturing corporations, which was 5 percent in 1989.

The same disparity exists when profits are expressed in relation to assets or equity. In 1989, the aerospace profit as a percentage of assets amounted to 3.3 percent; for all U.S. manufacturing industries, the figure was 5.6 percent. As a percentage of equity, the aerospace profit was 10.7 percent, the all-manufacturing industry average 13.7 percent.

Aerospace expenditures for new plant and equipment reached all-time record levels in both current and constant dollars. In current dollars, outlays amounted to $4.1 billion, up from $3.4 billion in 1988. For 1990, the Bureau of Economic Analysis of the Department of Com-

merce estimates a new record level for aerospace of $4.3 billion in current dollars.

The aerospace industry's balance sheet, as reported by the Bureau of the Census, showed an increase in total assets to $121.4 billion (up from $109.5 billion). Net working capital increased from $11.8 billion in 1988 to $12.5 billion in 1989.

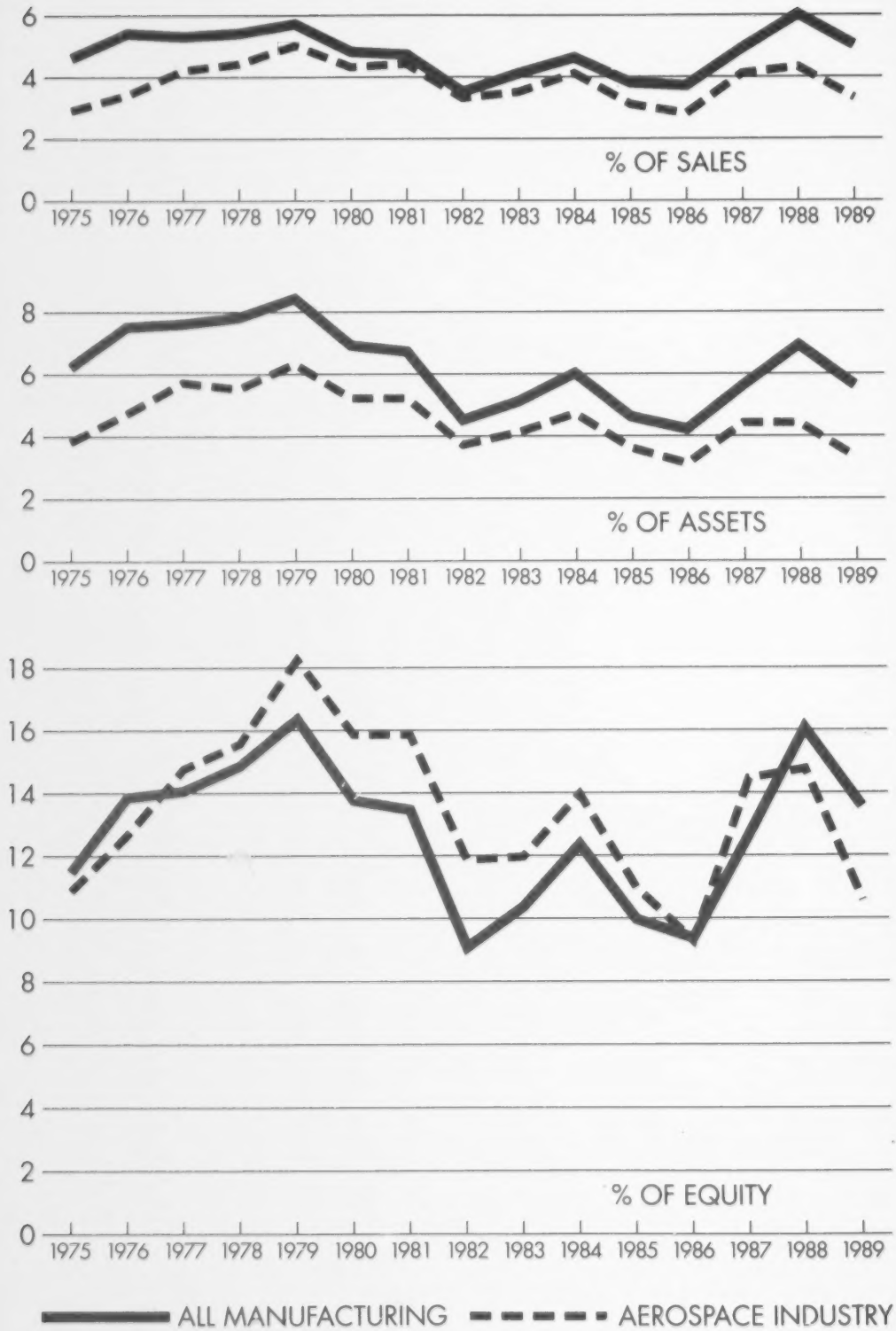
In Fiscal Year 1989, McDonnell Douglas Corporation retained its ranking as the leading Department of Defense contractor in terms of awarded contract dollar value. McDonnell Douglas received contracts with an aggregate value of $8.6 billion. In second place was General Dynamics Corporation with $6.9 billion, followed by General Electric Company with $5.8 billion, (the latter two companies also ranked second and third in 1988 and 1987).

Rounding out DoD's top 10 contractors for FY 1989 were Raytheon Company, $3.8 billion; General Motors Corporation, $3.7 billion; Lockheed Corporation, $3.7 billion; United Technologies Corporation, $3.6 billion; Martin Marietta Corporation, $3.3 billion; The Boeing Company, $2.9 billion; and Grumman Corporation, $2.4 billion. Compared with the previous year, Tenneco Inc. dropped out of the top 10 and Grumman moved up from 11th to 10th place.

Rockwell International Corporation, which placed 12th among DoD contractors, once again topped the list of NASA contractors with $1.7 billion in FY 1989. Lockheed Space Operations Company ($553 million) was second and McDonnell Douglas ($506 million) third. In fourth and fifth places were Thiokol Inc. ($420 million) and Martin Marietta ($355 million).

The rest of the top 10 included General Electric (300 million); Rockwell Space Operations Inc. ($287 million); Boeing ($236 million); Lockheed Engineering and Science Company ($217 million); and Ford Aerospace Corporation ($196 million). In comparison with FY 1988, Rockwell Space Operations and Ford Aerospace were new to the top 10; USBI Booster Production Company and EG&G Florida Inc. slipped out of the top 10 to 11th and 14th place respectively.

NET PROFIT AFTER TAXES



Source: Aerospace Industries Association.

NET PROFIT AFTER TAXES AS A PERCENT OF SALES, ASSETS, AND EQUITY FOR ALL MANUFACTURING CORPORATIONS AND THE AEROSPACE INDUSTRY[a]

Calendar Years 1975-1989

PERCENT OF SALES

Year	All Manufacturing Corporations	Non-Durable Goods	Durable Goods	Aerospace Industry
1975	4.6%	5.1%	4.1%	2.9%
1976	5.4	5.5	5.2	3.4
1977	5.3	5.3	5.3	4.2
1978	5.4	5.4	5.5	4.4
1979	5.7	6.1	5.2	5.0
1980	4.8	5.6	4.0	4.3
1981	4.7	5.1	4.3	4.4
1982	3.5	4.6	2.4	3.3
1983	4.1	4.9	3.1	3.5
1984	4.6r	4.8	4.4	4.1
1985	3.8	4.1	3.4	3.1
1986	3.7	4.6	2.9	2.8
1987	4.9	5.2	4.5	4.1
1988	6.0r	6.7r	5.2	4.3
1989	5.0	5.9	4.1	3.3

PERCENT OF ASSETS[b] AND EQUITY[b]

Year	Percent of Assets		Percent of Equity	
	All Manufacturing	Aerospace Industry	All Manufacturing	Aerospace Industry
1975	6.2%	3.8%	11.6%	11.0%
1976	7.5	4.7	14.0	12.8
1977	7.6	5.7	14.2	14.9
1978	7.8	5.5	15.0	15.7
1979	8.4	6.3	16.5	18.4
1980	6.9	5.2	13.9	16.0
1981	6.7	5.2	13.6	16.0r
1982	4.5	3.7	9.2	12.0
1983	5.1r	4.1	10.5r	12.1r
1984	6.0r	4.7	12.5	14.1
1985	4.6	3.6r	10.1	11.1
1986	4.2	3.1r	9.5	9.4
1987	5.6	4.4	12.8	14.6
1988	6.9r	4.4	16.2r	14.9
1989	5.6	3.3	13.7	10.7

Source: Bureau of the Census, "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations."

a Based on a sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, their propulsion and parts.

b Average of four quarters.

r Revised.

INCOME STATEMENT AND OPERATING RATIOS FOR AEROSPACE COMPANIES[a]

Calendar Years 1986-1989
(Millions of Dollars)

INCOME STATEMENT	1986	1987	1988	1989
Net Sales, Receipts, Operating Revenues	$111,580	$110,992[r]	$112,846	$118,231
Less: Depreciation, Depletion & Amortization of Property, Plant and Equipment	3,411	3,636	3,775	4,012
Less: All Other Operating Costs & Expenses, Including Selling Costs & General & Administrative Expenses	102,568	101,053	103,098	108,773
Income (or Loss) from Operations	$ 5,600	$ 6,303	$ 5,972	$ 5,447
Net Non-Operating Income (Expense)	(264)	499	739	(6)
Income (or Loss) before Income Taxes (= Total Income)	$ 5,337	$ 6,801	$ 6,711	$ 5,440
Less: Provision for Current & Deferred Domestic Income Taxes	2,243	2,219	1,828	1,574
Income (or Loss) after Income Taxes (= Net Profit)	$ 3,093	$ 4,582	$ 4,883	$ 3,867
Cash Dividends Charged to Retained Earnings	1,432	1,457	1,465	1,806
Net Income Retained in Business	$ 1,661	$ 3,125	$ 3,417	$ 2,061
Retained Earnings at Beginning of Year[b]	20,475	22,128	24,139	27,508
Adjustments to Retained Earnings[c]	(414)	(371)[r]	(66)	(1,467)
Retained Earnings at End of Year[d]	$ 21,722	$ 24,882	$ 27,490	$ 28,102
OPERATING RATIOS				
Income before Taxes as Percent of Net Sales	4.8%	6.1%	5.9%	4.6%
Provision for Current & Deferred Domestic Income Taxes as Percent of Income before Taxes (Total Income)	42.0	32.6	27.2	28.9
Income after Taxes (Net Profit) as Percent of Net Sales	2.8	4.1	4.3	3.3
Income after Taxes (Net Profit) as Percent of Stockholders' Equity[e]	9.4	14.6	14.9[r]	10.7
Income after Taxes (Net Profit) as Percent of Total Assets[e]	3.1[r]	4.4	4.4[r]	3.3

Source: Bureau of the Census, "Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations" (Quarterly).
NOTE: Detail may not add to totals because of rounding.

a Based on sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, their propulsion and parts.

b Beginning-of-year retained earnings for any particular year do not equal end-of-year retained earnings for the previous year because of rotation of small companies in survey sample.

c Other direct credits (or charges) to retained earnings (net), including stock and other non-cash dividends, etc.

d Retained Earnings at End of Year CALCULATED AS Retained Earnings at Beginning of Year PLUS Income (Loss) after Income Taxes MINUS Cash Dividends Charged to Retained Earnings PLUS Adjustments to Retained Earnings.

e Average of four quarters.

r Revised.

BALANCE SHEET FOR AEROSPACE COMPANIES[a]

December 31, 1986-1989
(Millions of Dollars)

	1986	1987	1988	1989
Assets:				
Current Assets				
Cash	$ 4,524	$ 3,592	$ 2,156	$ 1,474
Securities, Com'l Paper & Other Short-term Financial Investments	2,352	2,365	3,328	1,785
Total Cash and U.S. Gov't and Other Securities	$ 6,876	$ 5,956	$ 5,484	$ 3,259
Receivables (Total)	13,077	15,576	16,102	18,674
Inventories (Gross)	41,028	44,812	45,558	49,865
Other Current Assets	1,582	1,612	1,576	2,389
Total Current Assets	$ 62,562	$ 67,957	$ 68,720	$ 74,184
Net Plant, Property, & Equipment	22,103	22,017	22,211	24,425
Other Non-Current Assets	17,748	16,882	18,614	22,757
Total Assets	$102,414	$106,856	$109,545	$121,369
Liabilities:				
Current Liabilities				
Short Term Loans	$ 1,547	$ 1,551	$ 1,369	$ 3,798
Trade Accts. & Notes Payable	8,926	9,706	10,424	10,889
Income Taxes Accrued	5,723	6,393	3,519	1,925
Installments Due on Long Term Debts	545	1,109[r]	751	1,261
Other Current Liabilities	36,162	39,744[r]	40,825[r]	43,765
Total Current Liabilities	$ 52,903	$ 58,502	$ 56,888	$ 61,638
Long Term Debt	10,915	10,855	12,447	15,761
Other Non-Current Liabilities	5,701	5,807	6,342	7,067
Total Liabilities	$ 69,520	$ 75,164	$ 75,676	$ 84,465
Stockholders' Equity:				
Capital Stock	$ 11,172	$ 6,810	$ 6,379	$ 8,801
Retained Earnings	21,722	24,882	27,490	28,102
Total Stockholders' Equity	$ 32,894	$ 31,692	$ 33,869	$ 36,904
Total Liabilities & Stockholders' Equity	$102,414	$106,856	$109,545	$121,369
Net Working Capital	$ 9,659	$ 9,455	$ 11,832	$ 12,549

Source: Bureau of the Census, "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations" (Quarterly).
NOTE: Detail may not add to totals because of rounding.
a Based on sample of corporate entities classified in SIC codes 372 and 376, having as their principal activity the manufacture of aircraft, guided missiles, space vehicles, their propulsion and parts.
r Revised.

NEW PLANT AND EQUIPMENT EXPENDITURES

Calendar Years 1964-1990
(Billions of Dollars)

Year	All Industries	All Manufacturing Industries	Durable Goods	Aerospace[a]	
				Current Dollars	Constant Dollars 1982 = 100[b]
1964	$ 51.26	$ 21.23	$10.98	$0.41	$1.23
1965	59.52	25.41	13.49	0.53	1.58
1966	70.40	31.37	17.23	1.17	3.38
1967	72.75	32.25	17.83	1.25	3.50
1968	76.42	32.34	17.93	1.23	3.29
1969	85.74	36.27	19.97	1.29	3.30
1970	91.91	36.99	19.80	0.88	2.17
1971	92.91	33.60	16.78	0.63	1.48
1972	103.40	35.42	18.22	0.68	1.57
1973	120.03	42.35	22.63	0.79	1.77
1974	139.67	52.48	26.77	1.21	2.46
1975	142.42	53.66	25.37	1.19	2.12
1976	158.44	58.53	27.50	1.02	1.70
1977	184.82	67.48	32.77	1.14	1.77
1978	217.76	78.58	39.46	1.76	2.50
1979	254.96	95.92	48.50	2.70	3.49
1980	282.80	112.33	55.36	3.57	4.25
1981	315.22	126.54	59.81	3.36	3.62
1982	310.58	120.68	55.35	3.41	3.41
1983	304.78	116.20	53.08	2.91	3.06
1984	354.44	138.82	66.24	3.57	3.79
1985	387.13	153.48	73.27	3.45	3.74
1986	379.47	142.69	69.14	3.80	4.04
1987	389.67	145.90	71.01[r]	3.54	3.91
1988	430.76	166.32	78.30	3.44	3.81
1989	475.52	184.54[r]	83.68	4.12	4.55
1990[E]	507.23	190.89	85.71	4.28	4.98

Source: Bureau of Economic Analysis, "Plant and Equipment Expenditures and Plans" (Quarterly).

a Data are company-based (not establishment- nor product-based), and represent corporate entities whose principal activity falls in SIC Codes 372 and 376.

b Aerospace constant dollars based on BEA's industry deflator for historical data and Durable Goods deflator for current year estimates.

E Estimate.

r Revised.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MAJOR CONTRACTORS

Fiscal Years 1985-1989
By rank according to net value of NASA prime contracts awarded during last fiscal year
(Millions of Dollars)

Company	1985	1986	1987	1988	1989
TOTAL PROCUREMENTS	$8,298	$8,180	$8,610	$9,545	$10,876
Awards to Business Firms	6,653	6,356	6,541	7,275	8,568
% of TOTAL PROCUREMENTS	80%	78%	76%	76%	79%
Rockwell International Corp.	$1,345	$1,156	$1,610	$1,714	$ 1,692
Lockheed Space Operations Co.	551	559	323	474	553
McDonnell Douglas Corp.	194	266	285	299	506
Thiokol Inc.	334	320	286	423	420
Martin Marietta Corp.	483	427	326	341	355
General Electric Co.[b]	146[r]	207	225	211	300
Rockwell Space Operations Inc.	(a)	(a)	(a)	(a)	287
The Boeing Co.	69	113	175	260	236
Lockheed Engrg. & Science Co.	125	124	163	178	217
Ford Aerospace Corp.	120	208	120	137	196
USBI Booster Production Co.	207	196	183	191	196
TRW Inc.	103	85	124	143	193
Computer Sciences Corp.	102	96	90	151	192
EG&G Florida Inc.	108	117	131	156	187
Boeing Computer Support Services	(a)	(a)	(a)	(a)	158
Allied Signal Aerospace Co.[c]	150	138	142	152	156
Lockheed Missiles & Space Co.	137	121	108	141	145
United Technologies Corp.	110	97	166	91	133
IBM Corp.	124	94	72	87	102
Grumman Aerospace Corp.	10	9	23	74	80
Sverdrup Technology Inc.	7	15	27	38	65
Pan American World Serv. Inc.	49	47	60	70	60
Teledyne Industries Inc.	46	48	38	40	52
Contel Corp.	(a)	69	81	76	51
Cray Research Inc.	19	10	11	31	48
Boeing Technical Operations Inc.	39	36	27	42	41
Planning Research Corp.	65	51	37	47	39
Fairchild Industries	20	26	24	24	38
Aerojet General Corp.	10	20	26	22	37
NSI Technology Serv. Corp.	(a)	(a)	(a)	25	36

Source: National Aeronautics and Space Administration, "NASA Annual Procurement Report" (Annually).
a Not in list of major contractors for indicated year(s).
b Includes awards previously reported for RCA Corp.
c Reported in FY 89 as Bendix Field Engineering.
r Revised.

DEPARTMENT OF DEFENSE MAJOR CONTRACTORS

Fiscal Years 1985-1989
Listed by rank according to net value of prime contracts awarded during last fiscal year
(Millions of Dollars)

Company	1985	1986	1987	1988	1989
TOTAL CONTRACTS	$150,674	$145,742	$142,483	$137,049	$128,958
McDonnell Douglas Corp.	$ 8,857	$ 6,586	$ 7,715	$ 8,003	$ 8,617
General Dynamics Corp.	7,440	8,013	7,041	6,522	6,899
General Electric Co.	5,891	6,847	5,802	5,701	5,771
Raytheon Co.	2,999	4,052	3,820	4,055	3,761
General Motors Corp.[b]	5,166[r]	5,069	4,082	3,550	3,692
Lockheed Corp.	5,082	4,896	5,574	3,538	3,652
United Technologies Corp.	3,906	3,527	3,587	3,508	3,556
Martin Marietta Corp.	2,717	2,935	3,726	3,715	3,337
The Boeing Co.	5,458	3,556	3,547	3,018	2,868
Grumman Corp.	2,733	2,967	3,393	2,848	2,373
GTE Corp.	611	1,041	1,475	423	2,342
Rockwell International Corp.	6,264	5,590	2,238	2,184	2,133
Westinghouse Electric Corp.	1,941	1,713	1,684	2,185	1,650
Honeywell Inc.	1,908	1,846	2,008	1,366	1,555
Litton Industries Inc.	1,528	1,663	2,035	2,561	1,437
IBM Corp.	1,783	1,359	1,822	1,065	1,309
TRW Inc.	1,079	1,053	1,135	1,250	1,294
Unisys Corp.[c]	1,910[r]	1,897	2,268	1,380	1,245
ITT Corp.	1,503	799	995	769	1,163
Texas Instruments Inc.	1,426	1,435	1,109	1,232	946
Tenneco Inc.	1,250	477	2,053	5,058	916
Textron Inc.	1,920	1,671	1,546	1,276	908
Allied Signal Inc.	1,348	1,043	943	711	906
Avondale Industries Inc.[d]	1,156	395	270	580	879
FMC Corp.	831	863	744	862	796
Gencorp Inc.	566	643	874	639	789
LTV Corp.	1,585	1,445	1,308	942	757
Ford Motor Co.	1,019	752	509	791	754
Foundation Health	*(a)*	*(a)*	*(a)*	*(a)*	639
Northrop Corp.	1,195	742	1,068	533	631

Source: Department of Defense, "100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards" (Annually).

a Not in top 100 companies for indicated year(s).
b Includes amounts previously reported for Hughes Aircraft Co.
c Includes amounts previously reported for Sperry and Burroughs Corporations.
d Includes amounts previously reported for Ogden Corp.
r Revised.

DEPARTMENT OF DEFENSE
PRIME CONTRACT AWARDS OVER $25,000
FOR SELECTED MAJOR MILITARY HARD GOODS

By Geographic Region
Fiscal Years 1987, 1988, and 1989

Program and Region	Millions of Dollars			Percent of Program Total		
	1987	1988	1989	1987	1988	1989
AIRCRAFT—TOTAL	$29,478	$27,089	$27,565	100.0%	100.0%	100.0%
New England	3,470	3,466	3,872	11.8	12.8	14.0
Middle Atlantic	3,765	3,211	2,738	12.8	11.9	9.9
East North Central	3,059	2,760	2,797	10.4	10.2	10.1
West North Central	4,820	4,307	5,082	16.4	15.9	18.4
South Atlantic	4,448	2,602	2,142	15.1	9.6	7.8
East South Central	352	342	222	1.2	1.3	0.8
West South Central	4,027	4,038	4,458	13.7	14.9	16.2
Mountain	1,394	880	1,175	4.7	3.3	4.3
Pacific[a]	4,145	5,482	5,079	14.1	20.2	18.4
MISSILE & SPACE SYSTEMS—TOTAL	$21,631	$21,450	$20,656	100.0%	100.0%	100.0%
New England	3,423[r]	3,324	3,075	15.8	15.5	14.9
Middle Atlantic	1,262	1,354	1,263	5.8	6.3	6.1
East North Central	193	167	102	0.9	0.8	0.5
West North Central	1,209	1,108	1,034	5.6	5.2	5.0
South Atlantic	1,424	1,612	1,525	6.6	7.5	7.4
East South Central	627	828	921	2.9	3.9	4.5
West South Central	1,516	1,416	1,255	7.0	6.6	6.1
Mountain	3,588	3,420	3,584	16.6	15.9	17.4
Pacific[a]	8,390	8,219	7,896	38.8	38.3[r]	38.2
ELECTRONICS & COMMUNICATIONS EQUIPMENT—TOTAL	$23,886	$18,588	$19,369	100.0%	100.0%	100.0%
New England	2,819	1,730	3,464	11.8	9.3	17.9
Middle Atlantic	4,281	3,429	3,222	17.9	18.4	16.6
East North Central	1,715	1,275	1,345	7.2	6.9	6.9
West North Central	1,489	1,030	938	6.2	5.5	4.8
South Atlantic	6,345	5,006	4,430	26.6	26.9	22.9
East South Central	136	124	94	0.6	0.7	0.5
West South Central	926	1,208	1,014	3.9	6.5	5.2
Mountain	1,042	1,038	900	4.4	5.6	4.6
Pacific[a]	5,134	3,747	3,962	21.5	20.2	20.5

Source: Department of Defense, "Prime Contract Awards by Region and State" (Annually).
NOTE: Detail may not add to totals because of rounding.
a Includes Alaska and Hawaii.
r Revised.

90-91

Aeronautics: the science that treats of the operation of aircraft, also, the art or science of operating aircraft.

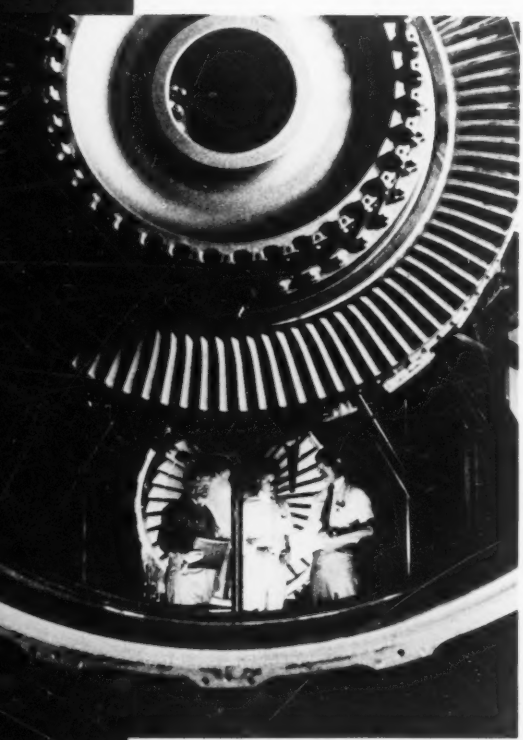
AIA: Aerospace Industries Association of America, Inc., formerly Aircraft Industries Association.

Aerospace Industry: the industry engaged in research, development and manufacture of aerospace systems, including manned and unmanned aircraft; missiles, space launch vehicles, and spacecraft; propulsion, guidance and control units for all of the foregoing; and a variety of airborne and ground based equipment essential to the test, operation, and maintenance of flight vehicles.

Aerospace Employment: annual average calculated as one-twelfth of sum of monthly estimates of total number of persons employed during a designated pay period by the aircraft and missile and space industries (SIC 372 and 376) plus estimated aerospace-related employment in the communications equipment (SIC 3662) and instruments (SIC 381 and 382) industries and in certain other industries (SIC 28, 35, 73, 89, etc.).

Aerospace Payroll: estimated on the basis of average weekly earnings for a given calendar year for production workers plus an estimated annual salary for other employees.

Aerospace Sales: the AIA estimate of aerospace industry sales, developed by summing DOD expenditures for aircraft, missiles, and space-related procurement and RDT&E; NASA expenditures for research and development, and space flight control and data communications; outlays for space activities by other U.S. Government departments and agencies; commercial sales of space-related products; net domestic and export sales of civil aircraft, engines, and parts; FMS and commercial exports of military aircraft, missiles, propulsion, and related parts; and sales of related



products and services, including electronics, software, and ground support equipment, plus sales of non-aerospace products which are produced in aerospace-manufacturing establishments and which use technology, processes, and materials derived from the aerospace industry. See also **Related Products and Services.**

Air Carriers: the commercial system of air transportation, consisting of domestic and international scheduled and charter service.

Aircraft: all airborne vehicles supported either by buoyancy or by dynamic action. Used in this volume in a restricted sense to mean an airplane—any winged aircraft, including helicopters but excluding gliders and guided missiles.

Aircraft Agreement (Agreement on Trade in Civil Aircraft): negotiated in the Tokyo Round of the Multilateral Trade Negotiations, and implemented January 1, 1980, providing for elimination of tariff and non-tariff trade barriers in the civil aircraft sector.

Aircraft Industry: the industry primarily engaged in the manufacture of aircraft, aircraft engines and parts, aircraft propellers and parts, and aircraft parts and auxiliary equipment. A sector of the **Aerospace Industry.**

Airframe: the structural components of an airplane, such as fuselage, empennage, wings, landing gear, and engine mounts, but excluding such items as engines, accessories, electronics and other parts that may be replaced from time to time.

Airlines: see **Air Carriers.**

Appropriation (Federal Budget): an act of Congress authorizing an agency to incur obligations and make payments out of funds held by the Department of the Treasury.

Assets, Net: the sum of all recorded assets after reducing such amount by allowance of reserve for bad debts, depreciation and amortization, but before deducting any liabilities, mortgages or other indebtedness.

Astronautics: the art and science of designing, building and operating manned or unmanned space objects.

Average Weekly Hours: average hours for which pay was received; different from standard or scheduled hours.

Avionics: Communications, navigation, flight controls, and displays.

Backlog: the sales value of orders accepted (supported by legal documents) that have not yet passed through the sales account.

Budget Authority: authority provided by the Congress; mainly in the form of **Appropriations,** which allows Federal agencies to incur obligations to spend or lend money.

Bureau of the Census: an agency of the Department of Commerce.

Bureau of Economic Analysis (BEA): an agency of the Department of Commerce.

Bureau of Labor Statistics (BLS): an agency of the Department of Labor.

Constant Dollars, see **Deflator.**

Deflator: index used to convert a price level to one comparable with the price level at a different time, offsetting the effect of inflation. The base period, which equals 100, is usually specified as either a given fiscal or calendar year. **Constant Dollars** are calculated by dividing current ('then-year') dollars by appropriate price deflator, and multiplying by 100.

Depreciation: the general conversion of the depreciable cost of a fixed asset into expense, spread over its remaining life. There are a number of methods, all based on a periodic charge to an expense account and a corresponding credit to a reserve account.

Development: the process or activity of working out a basic design, idea or piece of equipment. See also **R&D.**

DOD: Department of Defense.

DOE: Department of Energy.

DOT: Department of Transportation.

Durable Goods Industry: comprised of major manufacturing industry groups with SIC Codes 24, 25, and 32-39. All major manufacturing industry groups in SIC Codes 20-23 and 26-31 are considered nondurable goods manufacturing industry groups.

Earnings: the actual return to the worker for a stated period of time. Irregular bonuses, retroactive items, payments of various welfare benefits, and payroll taxes paid by employers are excluded.

Average Hourly Earnings: on a "gross" basis, reflecting not only changes in basic hourly and incentive wage rates, but also such variable factors as premium pay for overtime and late shift work, and changes in output of workers paid for an incentive plan.

Average Weekly Earnings: derived by multiplying average weekly hours by hourly earnings.

ERDA: Energy, Research and Development Administration. ERDA was formed in 1974 to bring together activities previously scattered among several agencies. The major elements covered were nuclear energy, fossil energy, solar and geothermal energy, conservation through increased efficiency and environmental controls. Most of these functions were assumed by the Department of Energy as of October 1, 1977.

Establishment: the basis for reporting to the Census of Manufacturers; an operating facility in a single location.

Evaluation: (Department of Defense): determination of technical suitability of material, equipment or a system; see **RDT&E.**

Expenditures (Federal Budget): see **Outlays.**

Exports: domestic merchandise including commodities which are grown, produced, or manufactured in the United States, and commodities of foreign origin which have been changed in the United States from the form in which they were imported, or which have been enhanced in value by further manufacture in the United States, and which are traded or sold to other nations.

Export-Import Bank of the United States (Eximbank): created in 1934, and established as an independent U.S. Government Agency in 1945, Eximbank is designed "... to aid in financing and to facilitate exports ..." Eximbank receives no appropriations from the U.S. Congress. It is directed by statute to (1) offer financing that is competitive with that offered exporters of other countries by their official export credit institutions, (2) determine that the transactions supported provide for a reasonable assurance of repayment, (3) supplement, but not compete with private sources of export financing, and (4) take into account the effect of its activities on small business, the domestic economy, and U.S. employment.

FAA: Federal Aviation Administration (formerly the Federal Aviation Agency), an agency of the Department of Transportation.

Facility: a physical plant or installation including real property, building, structures, improvements and plant equipment.

Fiscal Year (Federal Budget): until June 30, 1976, year beginning July 1 and ending June 30, and designated by the year in which it ends. Beginning October 1, 1976, the fiscal years run from October 1 through September 30 and are designated by the year in which they end. A three month **Transition Quarter** from July 1 through September 30, 1976, belongs to neither fiscal year.

Flyaway Value: includes the cost of the airframe, engines, electronics, communications, armament and other installed equipment.

Foreign Military Sales (FMS): export sales to foreign governments arranged through the Department of Defense, whereby DOD recovers full purchase price and administrative costs; often mistakenly used to include foreign military aid and foreign commercial sales as well.

FY: see **Fiscal Year.**

General Agreement on Tariff and Trade (GATT): a multilateral treaty, subscribed to by 98 governments which together account for more than four-fifths of world trade; its aim is to liberalize world trade; the only multilateral instrument that lays down agreed rules for international trade.

General Aviation: all civil flying except that of air carriers.

GNP (Gross National Product): the market value of the total output of

goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for business and institutional consumption of durable goods. It includes the purchase of goods and services by consumers and government, gross private domestic investment and net exports.

Helicopter: a rotary-wing aircraft which depends principally for its support and motion in the air upon the lift generated by one or more power-driven rotors, rotating on substantially vertical axes. A helicopter is a **V/STOL.**

Heliport: an area, either at ground level or elevated on a structure, that is used for the landing and take-off of **helicopters** and includes some or all of the various facilities useful to helicopter operations such as helicopter parking, hangar, waiting room, fueling and maintenance equipment.

Helistop: a minimum facility **heliport,** either at ground level or elevated on a structure for the landing and takeoff of **helicopters** but without such auxiliary facilities as waiting room, hangar parking, etc.

ICBM: Intercontinental Ballistic Missile, with a range of more than 5,000 miles.

Imports: classified as "general imports" or "imports for consumption." This volume refers generally to "imports for consumption," which are entries for immediate consumption plus merchandise withdrawn from bonded storage warehouses for consumption. Data are compiled from Import Entries filed with U.S. Customs officials, and are in general based on the market value or price in the foreign country at the time of exportation of such merchandise, including the cost of containers and coverings, as well as other charges and expenses incidental to placing the merchandise in condition, packed and ready for shipment to the United States, but excluding import duties, insurance, freight and other charges incidental to arrival of the goods in the United States. The foreign values of imported merchandise are converted into U.S. currency at the rate of exchange prevailing on the day the merchandise is shipped to the United States.

Income:

Net Operating Income: total net sales (see **Sales**) less total operating costs.

Net Income (Before Income Taxes): Net Operating Income plus or minus **"Other Income and Expenses."**

Other Income and Expenses: includes interest income, royalty income, capital gains and losses, interest expense, cash discounts, etc.

Net Income (After Income Taxes): Net Income (Before Taxes) less federal income taxes.

Lump-Sum Wage Payment: a one time payment given in lieu of general wage increases and/or cost of living adjustments in labor settlements.

Manufacturing Industries: those **establishments** engaged in the mechanical or chemical transformation of inorganic or organic substances into new products, and usually described as plants, factories, or mills, which characteristically use power-driven machines and materials-handling equipment; also establishments engaged in assembling component parts of manufactured products if the new product is neither a structure nor other fixed improvement.

Merchandise Trade Balance: the difference between the value of U.S. goods exported to other countries and foreign goods imported into this country. The trade balance is generally regarded as "favorable" when **exports** exceed **imports**—a trade surplus—and "unfavorable" when **imports** exceed **exports**—a trade deficit.

Missile: sometimes applied to space launch vehicles, but more properly connotes automated weapons of warfare, *i.e.*, a weapon which has an integral system of guidance, as opposed to the unguided rocket.

Multilateral Trade Negotiations (MTN): a forum within the **GATT** in which countries negotiate to overcome their trade problems. In September 1986, in Punta del Este, Uraguay, over 100 nations launched a new round of multilateral trade negotiations, called the "Uraguay Round." The purpose of the

"Uraguay Round" is to strengthen the **GATT** and expand its disciplines to new areas such as services, agriculture and trade-related intellectual property rights.

NASA: National Aeronautics and Space Administration.

NATO: North Atlantic Treaty Organization.

New Obligational Authority (Federal Budget): see **Budget Authority.**

Non-Aerospace Products and Services: products and services other than aircraft, missiles, space vehicles, and related propulsion and parts, produced or performed by establishments whose principal business is the development and/or manufacture of aerospace products.

OASD: Office of the Assistant Secretary of Defense.

Obligations (Federal Budget): commitments made by Federal agencies to pay out money for products, services or other purposes—as distinct from the actual payments. Obligations incurred may not be larger than **budget authority.**

Orders, Net New: the sales value of new orders (supported by legal documents) minus cancellations during the period.

Other Aerospace Products and Services: all conversions, modifications, site activation, and other aerospace products (including drones) and services, plus research and development under contract, defined as basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

Other Customers: All customers other than the U.S. Government to include but not limited to: air carriers, private citizens and corporations, state, local, and foreign governments.

Outlays: checks issued, interest accrued on the public debt, or other payments made, net of refunds and reimbursements.

Overtime Hours: that portion of the gross average weekly hours which was in excess of regular hours and for which premium payments were made.

Passenger-Mile: one passenger moved one mile.

Payroll, All Manufacturing: includes the gross earning paid in the calendar year to all employees on the payroll of operating manufacturing **establishments.** Includes all forms of compensation paid directly to workers such as salaries, wages, commissions, dismissal pay, all bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. Does not include employers' Social Security contributions or other non-payroll labor costs such as employees' pension plans, group insurance premiums, and workmen s compensation.

Procurement: the process whereby the executive agencies of the Federal Government acquire goods and services from enterprises other than the Federal Government.

Production Workers: includes working foremen and all non-supervisory workers (including leadmen and trainees) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, janitorial services, product development, auxiliary production for plant's own use and record keeping and services closely associated with the above production operations.

R&D: Research and Development.

Research: systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either **basic** or **applied** according to the objectives of the sponsoring agency.

Basic Research: with the objective of gaining fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

Applied Research: with the objective of gaining knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

Development: the systematic use of scientific knowledge directed toward the production of useful materials, de-

vices, systems, or methods including design and development of prototype and processes.

Independent Research and Development (IR&D): a term devised by the Department of Defense and used by Federal agencies to differentiate between a contractor's research and development technical effort performed under a contract, grant, or other arrangement (R&D) and that which is self-initiated and self-funded (IR&D).

Industrial Research and Development: research and development work performed within company facilities, funded by company or Federal funds, and excluding company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other non-profit organizations.

RDT&E: (Department of Defense): Research, Development, Test and Evaluation.

Related Products and Services: Sales of electronics, software, and ground equipment in support of aerospace products, plus sales by aerospace manufacturing establishments of systems and equipment which are generally derived from the industry's aerospace technological expertise in design, materials, and processes, but which are intended for applications other than flight.

Research: see **R&D.**

Rotorcraft: an aircraft which in all its usual flight attitudes is supported in the air wholly or in part by a rotor or rotors, *i.e.*, airfoils rotating or revolving about an axis (see **Helicopter**).

Sales: net of returns, allowances, and discounts, the dollar value of shipments, including dealer's commission, if any, which have passed through the sales account.

Satellite: a body that revolves around a larger body, such as the moon revolving around the earth, or a man-made object revolving about any body such as the sun, earth, or moon.

SIC (Standard Industrial Classification): a system developed by the U.S. Government to define the industrial composition of the economy, facilitating comparability of statistics. See **Aerospace Industry** for explanation of SIC codes applicable to the aerospace industry.

Space Vehicle: an artificial body operating in outer space (beyond the earth's atmosphere).

Stockholder's Equity: **assets** minus all obligations of the corporation, except those to stockholders. Annual data are average equity for the year (using four end-of-quarter figures.) For details, see "Quarterly Financial Report for Manufacturing, Mining and Trade Corporations," compiled by the Bureau of the Census.

STOL: short take-off and landing aircraft.

Test (Department of Defense): an experiment designed to assess progress in attainment or accomplishment of development objectives (see **RDT&E**).

Thrust: the driving force exerted by an engine, particularly an aircraft or missile engine, in propelling the vehicle to which it is attached.

Ton-Mile: one ton moved one mile.

Total Obligational Authority: the sum of **budget authority** granted or requested from the Congress in a given year, plus unused **budget authority** from prior years.

Trade Balance: see **Merchandise Trade Balance.**

Transition Quarter (Tr. Qtr.): the three-month interval from July 1, 1976 to September 30, 1976. See **Fiscal Year.**

Turbine, Turbo: a mechanical device or engine that spins in reaction to a fluid flow that passes through or over it. Frequently used in "turboprop" or "turbojet."

U.K.: United Kingdom.

U.S.: United States of America.

USA: United States Army, an agency of the U.S. Department of Defense.

USAF: United States Air Force, an agency of the U.S. Department of Defense.

USN: United States Navy, an agency of the U.S. Department of Defense.

USSR: Union of Soviet Socialist Republics.

Utility Aircraft: an aircraft designed for general purpose flying.

V/STOL: vertical short take-off and/or landing aircraft.

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Allied-Signal Aerospace Company
Aluminum Company of America
Argo-Tech Corporation
Bechtel National, Inc.
Best Foam Fabricators, Inc.
The BFGoodrich Company
B.H. Aircraft Company, Inc.
The Boeing Company
Celion Carbon Fibers
A Division of BASF Structural Materials, Inc.
Chrysler Technologies Corporation
Coltec Industries Inc.
Chandler Evans
Menasco Aerosystems
Walbar
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Fairchild Industries, Inc.
Fairchild Space and Defense Corporation
Ferranti Defense & Space Inc.
Marquardt
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